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AMERICAN JOURNAL OF OPHTHALMOLOGY
Volume 15 October, 1932 Number 10

THE EYES OF SCHOOL CHILDREN

EDWARD JACKSON, A.M., M.D.
DENVER

The importance of visual tests and eye examinations in the pre-school child is stressed a a routine procedure outlined.

Errors of refraction in the eyes of school children are of great importance. These are not anomalies, in the sense in which a coloboma of the iris, or chorioid, or a congenital dislocation of the crystalline lens is an anomaly. They are rather failures of the human eye to develop, with such exactness of proportions as best fit it for the accurate focusing of letters and small objects. This focusing is required during school years, and in many of the occupations that follow. Reading, sewing, and fine mechanical pursuits furnish occupations that require accurate vision throughout life. But the first important demand, for continuous seeing of this kind, comes when the child enters school. The whole system of popular education is based on using the eyes, for accurate near, binocular vision, several hours every day.

A few generations ago, but a small part of the people learned to read; and not one in a hundred looked forward to such fine work as making watches, or clocks, or even locks or keys, or fine shoes, or such sewing as is done by the sewing machine. For the mass of the people until then, accurate vision was needed to see things at a distance; as in hunting, or recognizing enemies, brute or human. Now the stitches made by a machine, the letters written with pen, or pencil, or stamped by printing press, or typewriter, or mimeograph, must be accurately seen at short distances; and the two eyes must be perfectly adjusted to work together. This is something totally different from the vision required by the lower animals, or for the child at play. The requirement for it has come very much faster than the slow process of evolution could supply the accuracy of vision required; and the first serious contact of the child with these requirements, comes when he enters school. Under laws for compulsory school attendance, every child is compelled, for eight or ten years, to spend a large part of his time in school, using this new kind of vision.

More than ninety-nine percent of all children are hyperopic at birth, and their accommodation is inadequate for continual, accurate, near vision. Each year in school the child will have to pass examinations in different branches, to determine if enough has been gained by his studies, to allow him to pass on to a higher grade in the school system. Is it not reasonable to require that at his entrance upon school work, and from time to time, as he keeps it up, he should be examined to find out if he has the vision needed for the pursuit of his studies? Visual disability for school work may come from ordinary moderate errors of refraction, from congenital defects, like opacities of lens, or cornea, from the results of ocular disease in early childhood, from congenital amblyopia, imperfect coordination for binocular vision, instability of the nervous system, that will make moderate nerve strain disastrous, or from lowered nutrition due to general disease. The examination to determine the child's fitness for school work must cover all these points. It is a medical examination, only to be made by one who has had a medical education. There are other things to be considered beside the need for glasses, and even the

need for glasses cannot be fairly estimated, without considering the general physical condition of the child.

A health examination, made by a school physician, is an ideal requirement for every child entering school. But because of the enormous amount of eye work every child is expected to do, the school examination must include testing of vision and some examination of the eyes. The number to be thus examined makes it imperative to make the routine examination, to which each child is submitted, as simple as is compatible with its effectiveness. But a simple examination, supplemented by the physician's outlook for disease in general, can be the most effective. For school purposes it is important that this examination should be complete, for every child first entering school. When the child really knows what is good sight, and has had freedom from symptoms of eye disorder, he can be trusted to call attention to symptoms of eye-strain, if they should subsequently arise.

Fig. 1 (Jackson). Incomplete square for use at ten meters.

A complete health and eye examination of every school child, is an immense extension of health service to the community. It has not often been undertaken for children in the public schools; but, in a few private and advanced schools, it has been tried; and has proved its value and importance. The general adoption and application of such a health policy, will call for a large number of workers with general medical education, and a good knowledge of children, and a liking for them. This will become a new branch of medicine, and a most important one. The best approach to such a service is by trained workers, in the ophthalmic examination of school children.

Testing the vision is an essential part of the examination for school children. Years ago it was thought that this was impracticable, giving unreliable results for children of the first or second grades. It was impracticable when attempted with the test cards of "Snellen letters". But working under the National Society for the Prevention of Blindness, Miss Brown and Mrs. Royer have demonstrated to school teachers and school nurses, in different parts of the country, that working with the "Snellen E", it was entirely practicable with pre-school children three years old. In Denver, Mrs. Royer, after demonstrating the plan on several pre-school children, took two little Italians, whose teacher said understood no English, but who had been watching the other children. They responded to the test promptly, and definitely proved that they had good, standard vision.

This method is by taking a test card of "Snellen Es", of different sizes, arranged in lines like the Snellen letters of the visual test card; and covering it with another card, which has an opening that will expose only one "E" at a time. The child is asked to tell, or point, which way that figure is turned. A simpler, more convenient, and equally effective way, is to take a square or circular card, having one incomplete square (fig. 1) printed on it; so that the child will have no clue to the direction of the open side. This is held and turned in different ways before a row of children, until they understand how they are to indicate which way the open side is turned.

Then the card is shown from a distance at which the direction of the opening is just distinguishable, by an eye with good (standard) vision. The children who can see it that far away are told to raise their hands. Each of these can be tested separately from this distance, three correct answers out of four showing the child has that vision; and each child is allowed to go, when he has proved what he can see. Then the card is brought nearer, until one of the remaining children can see it, when he is tested in the same way. To indicate distance at which each child recognizes the open side of the square, broad tacks, or adhesive strips are placed on the

floor, one meter apart, from the line of children to the distance the square can be recognized, by standard vision.

This plan utilizes the one explanation for the whole group, the spirit of emulation among children, and the disposition to imitate, or do what some one else has done. It makes the testing more rapid, and gives results that are more accurate and definite, than can be obtained with any card of test letters. By varying the distance the size of the retinal image may be varied, much better than by merely trying which line can be seen on the ordinary test card. One thing must be watched to make the results strictly accurate. In moving the card nearer the scholars, care must be taken to keep it well lighted. The light can be kept uniform, by showing the card all the time from one position; and allowing the children to come closer if they cannot see it at the full distance. But carefully taken, a record, even for children of three to five years, can be kept for comparison at any future time, or with those of any other group.

Next in importance to taking the acuteness of vision is the ophthalmoscopic examination. When Risley, with the younger men who assisted him, examined the 2422 eyes of school children in Philadelphia, every child was submitted to an ophthalmoscopic examination; which was as careful and complete as in the routine examination usually given to a private, or clinic patient, at his first visit. The experienced ophthalmologist reads the conditions of the eye, broadly, in a minute. Even a young student of ophthalmology can become fairly experienced in a few weeks, if he starts by making a systematic, careful survey of the media and fundus; and increases his speed after he has worked out his detailed method. The technic is best acquired in a clinic, on the refraction cases where cycloplegics are used. But for school children a mydriatic is not often needed, to secure a good view of the fundus. If a child has standard vision it may be safely assumed that nothing, except some rare pigmentation, could be discovered in the macula. Enough light for the child to look steadily at a point indicated, will not interfere with the examination. Starting with the disc the larger vessels can be quickly followed to all parts of the fundus, that have much to do with school vision.

In these examinations skiascopy, without cycloplegia, rapidly gives information of real value. With the undilated pupil the confusing aberration and irregular astigmatism, always found in the dilated pupil, are eliminated. By having the child look first across the room, and then at the examiner's finger, held to his forehead; the child's accommodation takes the place of any changing of glasses that would be needed, without it. The undilated pupil is the part that is used when the eyes are reading. Shutting off the periphery makes the appearance of astigmatism more evident, whether the astigmatism be regular or irregular. This kind of skiascopic examination discriminates sharply between myopia and such astigmatism as would cause poor vision. The certainty and definiteness, which skiascopy can give as to the presence of ametropia that must be corrected, makes it an important part of the examination. If glasses are to be prescribed at a school clinic, this first skiascopy is an important preliminary to the use of cycloplegia. Such help is to be suggested even if the parents have examinations for glasses made elsewhere. It will show the positive need for a cycloplegic, rather than for a glass salesman's counter prescription.

Any gross heterophoria, or weakness of ocular movements, is a serious handicap to the school child; and should be looked for by appropriate tests. Having the eyes fixed on the finger, or pencil, carried into different parts of the field of fixation, and the Maddox rod test of muscle balance, are the routine tests to be relied on. Weakness of convergence can be as disabling as high ametropia. The school child should be able to converge to within four inches of his eyes, and to keep up that much convergence for a minute. If there is any reason to suspect the field of vision may be deficient, the best test to determine this

is by the confrontation test, requiring the child to tell whether the fingers are held still or moving, in the periphery of the field.

This routine of tests seems formidable, when presented in this way; but practice will quickly enable one to test six to twelve children in an hour, and to record the essential facts ascertained for each. While applying the routine tests, any alert ophthalmologist can keep up a lookout for the various anomalies of the lids, lashes, tear passages, pupils, irides and eye movements. The time spent in such examinations has an educational value quite equal to that devoted to clinical work; and this kind of material is available in every town or country school. The isolated worker in ophthalmic practice may find in it the most important advantages to be secured by assisting in a large city clinic. Such examinations repeated from year to year, wherever they are needed, will educate the community, to the value and character of true ophthalmic service; better than any amount of advertising, or controversy about optometry. The doctor is expected to be a teacher; and he who neglects this part of his duty to the public, does so at his peril. He can never attain the recognition and influence, that properly belong to a helpful adviser of the public.

Examination of the eyes of school children is a health examination, intended to secure health by avoiding preventable disease. The time will come when health examinations will be as freely and liberally paid for, as any other service the public can receive from the medical profession. That time will come when the value of health examinations has been demonstrated to the public. Meanwhile the examination of the eyes of school children and recommendations based on such examinations, is one of the most effective ways to bring their value to the attention of the public. Many parents will understand that their children have thus received a real benefit. Each class so examined will contain some who will be greatly helped by it, and their benefit will be perceived by their classmates, as well as by parents and teachers. The having such examinations, and the benefits that arise from them, will have an important influence in educating the public as to the difference between an educated doctor of medicine, and a cult quack, christian science "practitioner", or spectacle salesman.

1120 Republic building.

KERATOPLASTY

An historical and experimental study, including a new method

Part II

RAMON CASTROVIEJO, M.D.
NEW YORK CITY

In this part of the author's study of keratoplasty his own procedure in operating is described together with the special instruments he designed for it. The results of this operation on forty rabbits, the clinical observations and the microscopic picture in each type of reaction to it, are reported. The work was done in the Division of Experimental Surgery of The Mayo Foundation, Rochester, Minnesota; while a special student in ophthalmology.

Author's experiments

Operations by the technic of von Hippel. Since I was firmly convinced that the only useful method was circumscribed, penetrating keratoplasty, and since the cases observed in Elschnig's clinic made a favorable impression, I determined to make a practical study of the method, and with this purpose in view, operated on twenty-six rabbits, under anesthesia, following in detail the technic described by Elschnig in his most recent paper.

After the operation, the eyelids were sutured to protect the eye. The first dressing was made forty-eight hours after the operation, with removal of the conjunctival sutures and instillation of atropine to dilate the pupil. The eyes were then dressed daily for the first week, the eyelids being kept sutured between dressings.

Unfortunately, rabbits do not seem to be as good material as human beings for this kind of operation, because in this series no successful transplant was obtained. Eleven transplants did not heal, and the eyes became infected. Ten healed, three of which became infected and seven completely opaque, six having anterior synechiæ and four formation of dehiscence. The remaining five rabbits died within three days after the operation as a consequence of the anesthesia or from causes having no relation to the operation.

The excessive number of transplants which did not heal was due, probably, to the fact that the rabbits could not be maintained in absolute quiet during the first eight days after the operation, as recommended by Elschnig. The compressive bandage that is recommended for use during the first two or three weeks was also impossible to apply. To these technical difficulties was probably due the opacification of the transplants that healed. Others did not heal because of the interposition of the thread between the lips of the wound, causing dehiscence, which was the origin of the detachment of the rest of the transplant.

In the course of the experiments, using this method, the following technical difficulties were found:

The operation is not as easy as it seems from reading descriptions of it. It is difficult to hold the trephine absolutely perpendicular to the cornea without exerting uneven pressure. Perforation of the anterior chamber does not take place, in most cases, in a uniform manner all around the corneal flap. It is, therefore, necessary to finish the dissection of the flap with scissors or with the knife in order to avoid injury to the iris or lens. Such injury is easily made with the trephine as soon as the anterior chamber has been opened and the cornea collapses.

The necessity of using eserine to protect the lens from injury by the trephine favors incarceration of the iris. The operation seems to be against the ideas of von Graefe, who stated that an eye should not be opened through the cornea without covering the incision with a conjunctival flap. Since the cornea is an avascular tissue, nutrition of the transplant must necessarily be very poor if vascularization does not take place. This is the reason why, in the

statistics of Elschnig, the percentage of successful transplants is so high in cases of parenchymatous keratitis, and so low in other conditions, such as burns, leukomas, and so forth, in which nutrition of the cornea is not increased, but rather, in most cases, diminished.

Another weak point in the operation of von Hippel, as practiced by Elschnig, is his way of holding the transplant in place by passing the bridge suture over the flap and inserting it in the bulbar conjunctiva. Sometimes the thread is found between the edges of the implant and the cornea of the host, thereby interfering with good healing. The pressure is not evenly applied over the whole surface of the flap but is exerted mostly along the two lines produced by the sutures passing over it, the uneven tension favoring detachment of the transplant. The success of the operation depends almost entirely on the application of a good compression bandage.

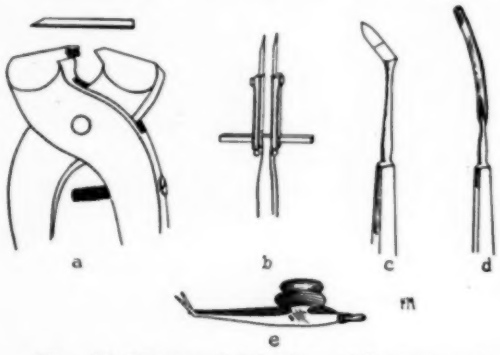

Fig. 12 (Castroviejo). Set of instruments required for author's operation.

The method of cutting into the cornea, with the edges perpendicular to its surface, favors the eventuality of the transplant's falling into the anterior chamber. Finally, the observation of Ascher, also proved by me, shows that the edges of the incision made by the trephine are irregular, especially on the corneal lamellæ, no matter how sharp the trephine is or how smoothly and steadily it runs. Besides, this operation leaves the eye unprotected in the event the transplant becomes displaced.

Operations by the technic of Thomas. Only four operations were performed by this technic of cross stitching and beveling flaps. One of the flaps did not heal and the other three became opaque. Microscopic study of the eyes showed that beveling of the flaps is more theoretical than real. The operation does not improve the nutrition of the flaps as compared with von Hippel's technic and also leaves the eye unprotected in case the transplant does not heal. Therefore, without pursuing this method further, which otherwise has been exhaustively studied by its originator, I decided to develop an operative technic of my own.

Author's operation. I decided to use a linear incision, which, to my mind, would give cleaner sections and would have a distinct advantage over the trephine, provided the problem of the size and form of the transplant could be solved. Realizing that such a delicate operation as corneal transplantation would require the finest instruments, extraordinarily sharp knives, made from razor-blade material, were used. Knives made of razor-blade material had been used by me for several years for different operations on the eyelids, and for minor operations on the eyeball, with excellent results. However, to Dr. Bustamante of Spain goes the credit for the idea of making regular surgical knives, such as I used, of razor-blade steel. Dr. Bustamante devised the nippers represented in figure 12a. These nippers are not used as an operative tool but as a tool maker. It is a nipper tool in which one of the cutting edges has been replaced by a piece of steel with a groove ground into it where the cutting edge of the other limb of the nippers fits. With these nippers, narrow bands of the best steel used for razor blades are cut in the desired width. Afterward, one end of this narrow band, obtained as above, is cut obliquely and finished as a knife in the shape represented in figure 12a.*

The finished blades are placed in a

* Information about the instruments herein mentioned, including knives, handles, keratomes, and so forth, can be obtained from V. Mueller and Co., Chicago, who make all the instruments, following my design.

handle which holds two blades, and which permits parallel incisions to be made simultaneously (fig. 12b.) The distance separating the blades can be adjusted to the different sizes of transplants.

The other special instrument is a keratome with a mark about 6 mm. from the point (fig. 12c). The blade of the keratome widens from the point to this mark, and both edges and the point are very sharp. From the mark to the handle the edges are parallel and dull. The total length of the keratome is 13 mm., and the width 4 mm. Experiments have shown this width to be the best. Two others were tried, 3 mm. and 5 mm., respectively but did not prove to have any advantage over that of 4 mm. An ordinary spatula and a deWecker's scissors (fig. 12d and e), with dull points, complete the set of special instruments necessary for the operation.

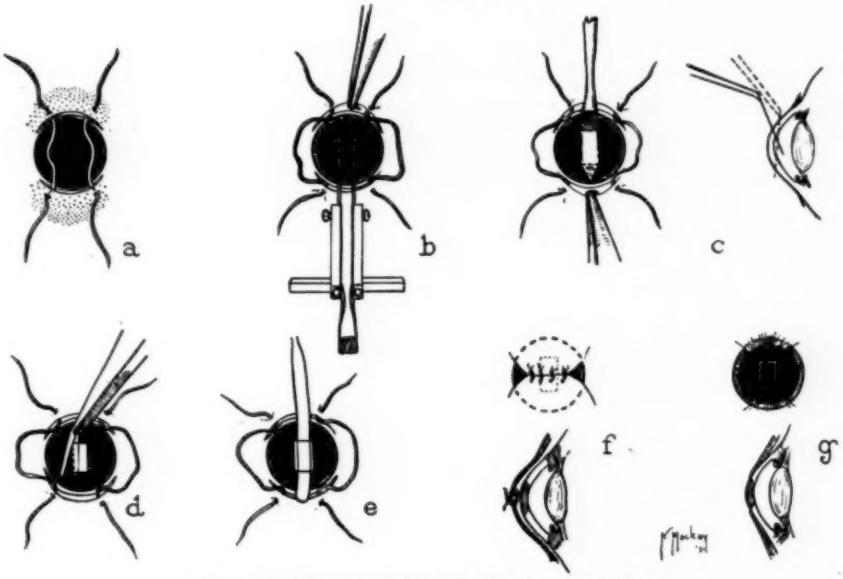

Fig. 13 (Castroviejo). Author's operation.

The experiments were performed on animals, chiefly rabbits, exchanging transplants between them. Three dogs were used for the purpose of determining the possibilities of heterotransplants, exchanging corneas with three rabbits.

Preparation of the rabbits. The day before the operation a one percent solution of atropine was instilled into the rabbits' eyes to dilate the pupils and was repeated on the day of the operation, until the pupils were fully dilated. Fifteen minutes before the operation three instillations of epinephrine, 1 to 1000, were made, five minutes apart. The object was to obtain an ischemic conjunctiva. The excess hair around the eyes was clipped as short as possible with scissors, especially that on the eyelids, and the area painted with mercurochrome. Anesthesia was obtained by intravenous injection of sodium isoamylethyl barbiturate (sodium amytal), injected very slowly into the veins of the ear until the rabbit was unconscious; afterwards anesthesia was maintained by ether. The anesthetization was a very important step, because if it was not total the rabbit kept moving its eye, making the operation very difficult; great care was necessary in giving the anesthetic, for rabbits are very susceptible to both sodium isoamylethyl barbiturate and to ether, and many of them died from the anesthesia.

After good anesthesia had been obtained, and the hair clipped, two drops of an aqueous solution of mercurochrome were instilled into the eye, and the excess washed out with physiologic

solution of sodium chloride, after which the rabbit was ready for operation. Of course, all these preparations must be made on two rabbits at the same time, for there must be no undue delay in exchange of flaps.

(I) Separation of the lids was maintained with lid retractors held by an assistant. Conjunctival incisions were made with scissors, above and below the cornea (fig. 13a), leaving two zones, one on each side at the horizontal meridian, through which the conjunctival incision did not reach. The conjunctiva above and below was undermined until two flaps were made, which could be stretched, with the aid of forceps, toward the center of the cornea, covering the central area of from 8 to 10 mm. (fig. 13f). Two sutures about 5 mm. apart were placed, reaching from the upper conjunctival flap to the lower. If an assistant was not available who could perform the operation in the other rabbit simultaneously, the eye of the first rabbit was kept covered with the eyelids to prevent drying of the cornea.

(II). The conjunctival sutures were drawn back from over the cornea (fig. 13b). The eye was fixed with a forceps, taking hold of the episclera near the limbus (Elschnig's forceps was used for this purpose). Then the twin knives, adjusted to a separation to agree with the width of the keratome, were used to make two vertical, parallel incisions, 7 mm. in length, traversing the pupillary zone, taking care not to exert too much pressure, which might lead to perforation of the cornea. These incisions acted only as guides, and cut only half to two-thirds of the thickness of the cornea. The incisions were usually plainly visible, but if they were not, fluorescein or methylene blue, 1 to 500, could be instilled, which would give a sharp outline.

(III) The eye was then fixed by taking hold of the episclera, near the limbus on the opposite side, where the keratome penetrated (fig. 13c). With the keratome, the cornea was incised at the upper end of the two vertical incisions, at an oblique angle of 45 degrees in relation to the tangent plane of the cornea at the point of penetration. As soon as the keratome had penetrated the anterior chamber, the direction of the point was changed to a more horizontal one in order to avoid injury to the lens. When the line marked on the keratome had reached the edge of the incision a counterpuncture was made below, directly opposite, making in this way a flap which always was slightly longer than 6 mm. For achievement of a perfect flap, it was necessary that the eye be kept well fixed, and that the instruments be very sharp; otherwise an oblique keratome incision might result, and a flap be obtained that would not fit.

(IV). The next step was to finish laterally, with the deWecker scissors (fig. 13d), the incisions commenced with the twin knives. The scissors were blunt, to avoid injury to iris and lens. When preparing the second rabbit in the same way, the cornea of the first was protected by the eyelids or by dropping physiologic solution of sodium chloride into the eye, to keep it wet.

(V). The transplant was then lifted with the spatula (fig. 13e) and the exchange of transplants made.

(VI). The conjunctival flaps were brought over the transplant (fig. 13f), sutures tied, and extra sutures placed; usually one more on each side of the original two was sufficient to cover the transplant completely with the conjunctiva.

(VII). A solution of atropine one percent was instilled into the eye, and sutures were placed in the eyelids, assuring perfect closure of the palpebral fissure; generally three sutures were sufficient.

Steps 3, 4, 5, and 6 were performed rapidly because the newly formed aqueous humor coagulated very rapidly and tended to cause shrinkage of the transplant, marring the success of the operation. If the aqueous humor coagulated it was removed with a forceps before placing the transplant in position.

After forty-eight hours the sutures in the eyelids were removed, and the eyeball was washed with oxycyanide of mercury, 1 to 5000; a one percent solution of atropine was instilled, and the eyelids were again sutured.

Forty-eight hours later, the eye was again inspected, the sutures of the conjunctival flaps were removed, and the eye was cleansed with a swab moistened with 1 to 5000 solution of oxycyanide of mercury, atropine was instilled, and the eyelids again were sutured. After the second dressing the eye had the appearance represented in figure 13g. The conjunctiva, in some cases, adhered to the upper and lower incisions; in others it retracted, coming back to its normal attachment. At this time, in a few cases, some portion of the conjunctival flap was necrotic, and this necrotic portion was removed with scissors, because, if it were not, infection might pass to the transplant. After the second dressing, the eye was inspected every day, a one percent solution of atropine instilled, and by the end of the first week, the eyelids did not need to be sutured.

Atropine was instilled daily for three weeks, at the end of which time, if complications had not arisen, the eye was completely healed and needed no more attention.

The advantages of this operative technic, over that of von Hippel as practiced by Elschnig, will now be enumerated:

As in the operation of von Hippel, the flaps are not touched with forceps and are therefore not traumatized.

The problem of the size and shape of the transplant has been solved by the combined use of the twin knives and the keratome. In each case the transplant obtained measures exactly 4 mm. wide and a trifle more than 6 mm. long with this advantage over the flaps obtained with the trephine, that the edges are very clean and regular.

The two incisions made with the keratome are beveled, thus increasing the surfaces of contact between the flap and the cornea of the host, and assuring perfect adaptation between them, thereby increasing the nutrition of the flap also.

Due to the beveling of the two edges of the transplant, the possibility of its falling into the anterior chamber is eliminated.

There is no danger of injury to lens or iris on account of the oblique penetration of the keratome into the anterior chamber. In eighty-two operations, there was not a single case in which this complication arose. The de Wecker scissors, used to complete the lateral incision, are dull pointed for the same reason.

The danger of injury to the lens having been removed, the pupil may be widely dilated before the operation, preventing in this way one of the principal complications that threatens the life of the transplant; that is, incarceration of the iris in the wound.

Passing the sutures over the transplant and inserting them in the conjunctiva, as in the operation of Elschnig, produces lines of tension; these have been eliminated in this new technic by substitution of conjunctival flaps, which give a more uniform pressure on the transplant, holding it in place, assuring perfect fit and protection during the first few days, increasing the nutrition of the transplant, and accelerating the process of healing. Furthermore, the conjunctival flaps make a perfect, water-tight closure, avoiding formation of fistulas and protecting the eye in the event of the transplant's falling out.

Finally, in spite of the apparent difficulty of the method, the technic can be easily mastered by the average surgeon after a few operations on animals.

Eighty-two animals were operated on, forty for the purpose of obtaining statistics of the operation just described, and the rest were used for different experiments, including homotransplants and heterotransplants. The results of the operations on the forty rabbits, using my technic, are given in four groups according to the degree of success obtained.

The first group was composed of fourteen rabbits (thirty-five percent of those operated on). The transplants remained transparent and did not differ from that of the normal cornea.

The second group comprised nineteen rabbits (forty-four and five-tenths percent of those operated on). The transplants were more or less hazy, giving them a grayish or nebulous aspect. However, by illuminating the anterior

chamber, the flaps appeared to be fairly transparent, to such an extent, in some instances that the pupil and the iris could be plainly distinguished when looking through the transplant with the ophthalmoscope. These transplants allowed some useful vision, estimated as equivalent to that which, in man, would be between the ability to distinguish

Fig. 14 (Castroviejo). Transparent transplant of over six months' duration in a rabbit's eye. (Notice the conjunctival flap still adherent to the lower temporal corner of the transplant.)

motion of the hand and the ability to count fingers at several feet. This is the reason for classifying these operations as partial successes.

In the third group were six rabbits (fifteen percent of those operated on), in which the transplants did not heal, or became completely opaque.

The fourth group was represented by one rabbit (two and five-tenths percent of those operated on). The rabbit died early. It had been set apart from the other groups because it died about fifteen days after the operation, and although the transplant was transparent at this time, ultimate success was not obtainable.

Several rabbits died within forty-eight hours after the operations, as a result of the anesthesia, and these have not been included in the statistics.

Of the fourteen rabbits whose corneas remained transparent (first group), in ten the postoperative course was without complications; in three, parenchymatous keratitis developed during about the third week, but responded to treatment with a one percent solution of atropine and metaphen ointment, the condition clearing entirely at the end of six weeks. The remaining rabbit of this group had a great reaction in its cornea, which opacified in an area of about two mm. surrounding the transplant, but the transplant remained completely transparent; (typical host reaction).

Three of the rabbits of this first group became ill and died, two with torticollis and one with enteritis. When it became apparent that they would die, they were killed, and the eyes enucleated and fixed for microscopic study. These rabbits had kept transparent flaps, one for three and a half months, another for four months, and the third for five months.

Five other rabbits of the first group died from causes not related to the operation, and had kept transparent flaps for a length of time varying from three to four and a half months. Six rabbits are still living, with good transparent transplants; two of them were operated on ten months ago; the other's have had from three and a half to six months' transparency, with no indications that the transplants will become hazy or in any way different from the rest of the normal cornea. Figure 14 is of a transparent transplant of six months' duration, in which the conjunctival flap is still adherent to the lower temporal corner of the transplant.

Some of the transparent transplants in the first group healed smoothly at the same level as the cornea of the host, and would therefore produce little, if any, astigmatism. In some others the transplant was not so even, and in these a certain amount of astigmatism has, no doubt, developed. During the first few weeks after the operation it was not possible to produce the oculopalpebral reflex by touching the transplant with a feather or small piece of cotton, but after three months the reflex was present, which seems to indicate nervous regeneration of the transplant. Whether such regeneration takes place within this interval must be determined later.

Of the partially successful cases (second group), in five there was necrosis of some portion of the conjunctival

flaps. This necrotic portion was removed at the second dressing, and atropine (one percent) and metaphen ointment were used daily. In the maneuver of removing the necrotic portion of the conjunctiva, the incision was reopened, and in three cases the aqueous humor drained out, resulting in the formation of dehiscence and the incarceration of the iris. The dehiscence healed at the end of the second or third week, but these eyes, as well as the two in which no fistulas formed, became more or less nebulous after three or four weeks of temporary transparency.

In four rabbits of this second group anterior synechia took place, and the transplants became hazy after four to six weeks of transparency, the cloudiness being on the posterior surface of the cornea. In three of these cases a few

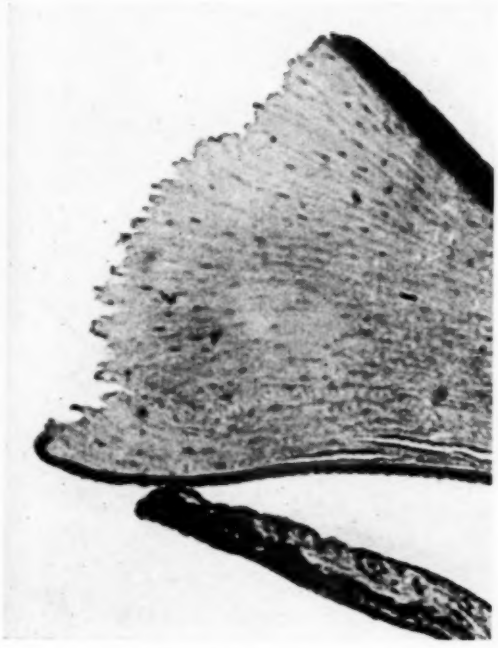

Fig. 15 (Castroviejo). Microscopic section of the cornea showing the irregularity of the incision produced by the trephine.

vessels from the adherent iris penetrated into the transplant.

Four other rabbits of the second group had a normal postoperative course for the first three weeks, and then parenchymatous keratitis suddenly developed, lasting about two weeks. Under daily treatment with one percent atropine and metaphen ointment, the keratitis subsided in about two weeks, and the eyes regained a part of their lost transparency, but all remained more or less cloudy. Three other rabbits followed a normal postoperative course, with no signs of inflammation or other complication, but, after a period of five to six weeks of transparency, one or two vessels penetrated slowly through one of the corners of the flap, coming from the limbus, and the implant gradually became hazy. Finally, in the three remaining cases, there was no known explanation of the cloudiness of the transplant, which gradually developed after the operation.

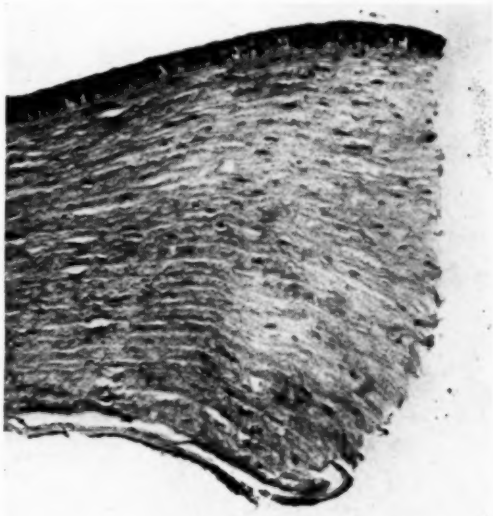

Fig. 16 (Castroviejo). Microscopic appearance of a section of the cornea made with razor-blade knives.

All of the third group of six rabbits became infected, and necrosis of the conjunctival flaps took place. This necrotic portion was excised at the second dressing four days after the operation. In two cases the flap failed to adhere, and the infection extended to the eye, where panophthalmitis developed. In the four remaining eyes the transplants adhered, but infection of the conjunctiva extended to the transplant and the iris. The eyes were inflamed for five or six weeks, at the end of which time

they gradually cleared, leaving anterior synechiæ and complete opacification of the transplants as sequels of the inflammation.

In the fourth group the rabbit died fifteen days after the operation. The

Fig. 17 (Castroviejo). Microscopic section of the cornea made with razor-blade knives and de Wecker scissors.

flap was perfectly transparent, and there had been no postoperative complications.

Operations by other methods. Besides the series of forty rabbits operated on for statistical purposes, thirty-six other rabbits were used, six of which died as a result of the anesthesia, or from causes in no way related to the operation. On the other thirty, six series of experiments were performed in order to determine the size of the transplants, the length of time the sutures should remain in the conjunctiva and eyelids, and the best condition of the pupil for the operation.

On two rabbits the operation described by Wolfe in 1873 was used. This consists in transplanting a band, 4 mm. wide, of the whole thickness of the cornea and conjunctival flaps (the Löhlein operation, using the whole thickness of the cornea). In both cases the lateral incisions gaped, with subsequent hernia of the iris and development of secondary glaucoma and opacification of the flap.

The pupils of five rabbits were not dilated. In every case, total anterior synechia developed, with subsequent opacification of the transplant.

In seven rabbits sutures of the conjunctiva and eyelids were left untouched for four days in order to discover whether infection, to which rabbits are so disposed, could be diminished by eliminating early dressings. In every case, after four days, the eyelids were edematous. There was abundant secretion and necrosis of both conjunctival flaps. Of the seven rabbits treated daily until the inflammation subsided, the corneas of three remained nebulous and four became opaque.

Of seven rabbits, the sutures of the conjunctiva were removed the second day after the operation and the eyelids kept sutured for the first week. Six of the transplants became opaque, of which three were dehiscent; one remained nebulous.

Five rabbits were operated on with

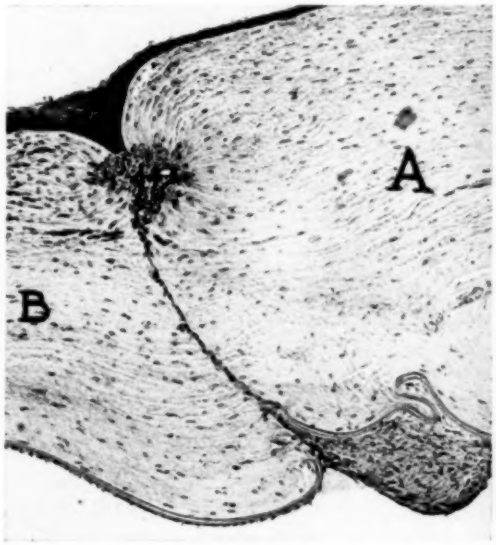

Fig. 18 (Castroviejo). Microscopic appearance of the cornea at the junction of a transparent flap (A) with the cornea of the host (B).

a keratome 5 mm. wide, by making a flap 7 mm. long, but otherwise following the details of the technic used in the rabbits operated on for statistical purposes. The flap in one case remained nebulous; in three, it became opaque,

and in one, it failed to heal. Finally, four rabbits were used in which metaphen ointment was placed over the transplant before suturing the conjunctiva; the ointment was left under the conjunctival flaps in order to find out if an antiseptic ointment would aid in healing the flaps. In all four cases the conjunctival flaps became necrotic toward the fourth day after the operation, and although the transplants healed without complications, three became hazy and one opaque.

Heterotransplants. One more series of experiments was performed; a series with heterotransplants, using three large rabbits and three small dogs, between which corneal transplants were exchanged; but the corneas of the dogs did not heal in the rabbits; and the transplants in the dogs after a good healing process, gradually became opaque.

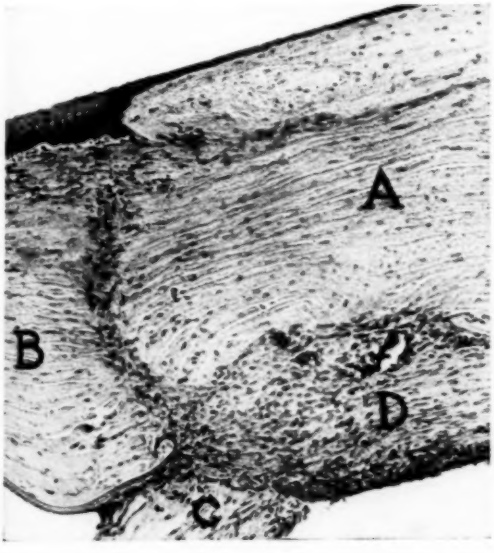

Fig. 19 (Castroviejo). Microscopic appearance of a section of the cornea at the junction of the transplant (A) with the cornea of the host (B). Anterior synechia at (C); connective tissue (D) has developed along the posterior surface of the transplant.

Microscopic study of sections made with the trephine disclosed that the edges were irregular, especially in the stroma of the cornea (fig. 15). Incisions made with razor blade knives, keratome and de Wecker scissors appeared very clean and regular under the microscope (figs. 16 and 17).

Transplants that remained transparent revealed in their entirety that they were absolutely normal in structure. In no place could it be found that the transplant had been replaced by the tissue of the host. The line of cicatrization (fig. 18) was visible, because in this place the epithelium penetrated slightly into the stroma in the direction of the incision. Bowman's membrane appeared to be broken, and there was a small amount of proliferation of connective tissue at the juncture. The rest of the incision was observed as a row of young connective-tissue cells, which crossed the whole thickness of the cornea obliquely. In the deeper layers, Descemet's membrane was interrupted and the ends rolled over and included in a small amount of proliferated connective tissue. Endothelium covered the newly formed connective tissue posteriorly. In the superficial layers of the corneal stroma of the host, surrounding the transplant, there was a slight infiltration of lymphocytes.

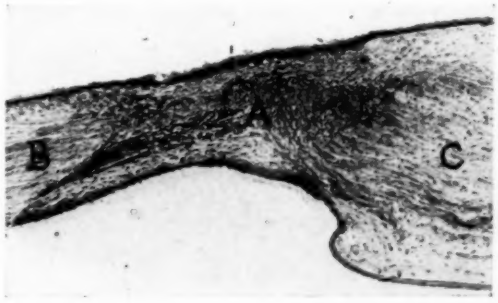

Fig. 20 (Castroviejo). Cross section of the cornea showing proliferation of connective tissue (A) in the place where a fistula has formed. [Notice the marked reduction in thickness of the transplant (B).] Cornea of the host (C).

In those cases in which anterior synechia took place, and the transplant became nebulous, the transplant had preserved its normal structure, but a layer of connective tissue had developed, which extended from the adherent iris over the transplant on its posterior surface, behind Descemet's membrane (fig. 19), which had partially dis-

appeared; the endothelium had disappeared entirely where there had been proliferation of connective tissue.

In some cases in which the transplant became opaque, and in which the iris penetrated between the lips of the incision, and healing did not take place normally, the structure of the transplant had become much altered. There was much proliferation of connective tissue, especially in the stroma, irregularity of the epithelium, and wrinkling of Bowman's and Descemet's membranes.

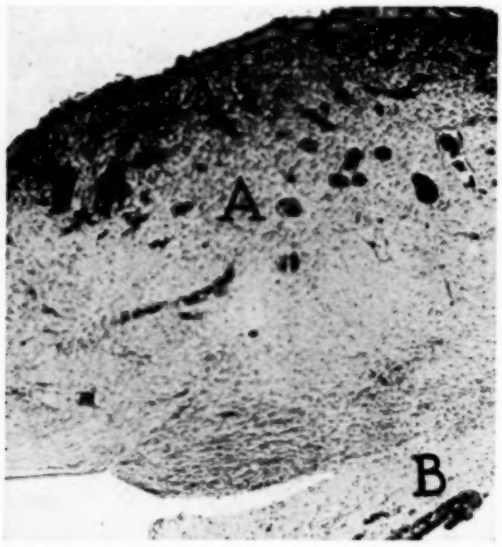

Fig. 21 (Castroviejo). Cross section of the cornea showing parenchymatous keratitis of the transplant (A). Notice the anterior synechia (B).

In those cases in which a fistula was formed, the cornea had been reduced to a third of its normal thickness (fig. 20), and Bowman's and Descemet's membranes, as well as the endothelium, were replaced by a layer of connective tissue. The epithelium was irregular and increased in two or three rows. The stroma also had almost been replaced by the proliferation of connective tissue.

In cases of parenchymatous keratitis, the transplant was much thickened (figs. 21 and 22). Numerous capillaries had been formed in the superficial and middle layers of the stroma and considerable infiltration of lymphocytes, polymorphonuclear leukocytes, epithelioid cells, connective-tissue cells, and cells of reticulo-endothelium were found around the newly formed vessels. In some of these transplants the epithelium and Bowman's membrane had disappeared. The iris was adherent to the posterior surface of the cornea. The endothelium had disappeared, and Descemet's membrane had also disappeared in some places.

Although it was possible to find only a few diplococci in the superficial layers, yet the absence of epithelium and of Bowman's membrane, the presence of the newly formed vessels, especially in the superficial layers, and the accumulation of so many cells around them, led to the supposition that I was dealing with an inflammatory reaction. The disappearance of most of the microorganisms could be explained by the defense offered by the tissue. Evidence of this defense was the presence of newly formed vessels and of many polymorphonuclear cells, lymphocytes, epithelioid cells, connective-tissue cells, and cells of the reticulo-endothelium.

Fig. 22 (Castroviejo). Same as figure 21 under greater magnification.

In some other eyes with opaque transplants (fig. 23), the posterior surface of the transplant was much shorter than

the anterior. Descemet's membrane was wrinkled and connective tissue had developed behind the transplant, coming from the cornea of the host. It seemed that the transplant curved posteriorly, a phenomenon which is often found clinically when an operation is performed slowly and the aqueous humor coagulates. This rolling of the transplant makes it useless because it does not fit into the defect, and favors incarceration of the iris and subsequent opacification.

Summary and Conclusions

The substitution of transparent flaps for opaque corneas is no longer a dream of ophthalmologists. The numerous experiments practiced, especially during the last few years, have demonstrated that in transplants taken from the same animal, or from a different animal of the same species, transparency can be preserved, that the nerves which were sectioned regenerate, and that the flaps remain for an indefinite time absolutely normal microscopically and clinically.

Of all the operations described up to the present time, those practiced by Elschnig on human subjects and by Thomas on rabbits have been by far the most successful.

The high average of successes obtained by Elschnig in cases of parenchymatous keratitis seems to indicate that the success is due in great part to the increased vascularization. Basing experiments on this detail, a technic with a view of improving the irregular incision produced by the trephine has been developed; also conjunctival flaps have been used, which furnish vascularization, uniform pressure on the transplant, increased nutrition, and acceleration of the process of healing.

The results of my observations may be summed up as follows:

Thirty-five percent of the transplants were successful and remained in normal condition, histologically and clinically, for a length of time justifying the supposition that the results were permanent.

Bridged sutures do not hold the transplant uniformly and sometimes interpose between the lips of the wound, interfering with good cicatrization.

Linear incisions made with a keratome, and twin knives made out of razor-blade material, seem to produce the cleanest and most regular sections. The keratome, knives, and de Wecker

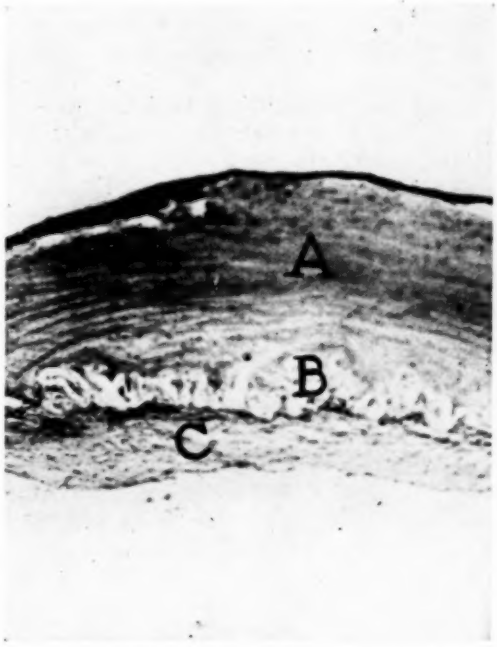

Fig. 23 (Castroviejo). Cross section of an opaque transplant (A) showing the rolling of the transplant, wrinkling of Descemet's membrane (B), and the proliferation of connective tissue (C).

scissors must be in perfect condition, because small irregularities in the edges of the incisions interfere with good healing.

The combined use of twin knives and the keratome allows the cutting of transplants of the same size in every case. The transplants are rectangular in shape, which is the best shape for obtaining beveling of both the transplant and the cornea of the host, for increasing the surfaces of contact, for permitting better adaptation of these surfaces and better nutrition, and for preventing the transplant from falling into the anterior chamber.

The use of conjunctival flaps is an essential procedure, because they furnish the even pressure necessary to all kinds of transplantation, accelerate the

process of healing by the increase of nutrition, and protect the eye in the event that the transplant does not heal. The advantage of using conjunctival flaps has been demonstrated in my experiments by the high average of transplants which have healed; ninety-five percent. This is a higher average than has hitherto been reported from the use of any other method.

The pupil must be widely dilated to avoid anterior synechia, which once established, leads to opacification of the transplant.

Exchange of transplants must be effected rapidly to avoid coagulation of the albuminous aqueous humor, which would produce rolling of the transplant, would not allow it to fit the defect properly, and would favor incarceration of the iris. In case the aqueous humor coagulates, the coagulum should be removed before placing the transplant in position.

Epinephrine is used before and during the operation to avoid bleeding from the conjunctival flaps, and great care should be taken when the operation is finished to remove the coagulum, which favors infection.

The only solutions used for the operation are mercurochrome, to sterilize the field, and physiologic solution of sodium chloride during the operation to prevent the cornea from getting dry. The transplant is passed from donor to host without being kept in any solution.

The best time to remove the conjunctival sutures is the fourth day. If they are left longer they may become infected and the conjunctival flaps necrotic; if removed sooner, adherence of the flaps is not strong, and fistulas or complete detachment may follow.

Infection, anterior synechia, fistulas, and parenchymatous keratitis are causes of opacification of the transplant.

Heterotransplants invariably become opaque.

All these experiments were done with normal corneas, and it may be supposed that the results would not be so satisfactory when operating on diseased corneas. However, judging from the high percentage of successful operations on animals, there is reason to hope that similar operations performed on human subjects in whom the operative field is larger, the danger of infection less, and in whom a greater amount of cooperation is available after the operation, might give an even higher percentage of success.

The Presbyterian hospital.

LIGHT-SENSE

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SAINT LOUIS

There has been much confusion in the study of this subject. Technic should be standardized. Certain principles are outlined for this. Tests of dark adaptation have proved the most satisfactory methods of studying light-sense. From the Department of Ophthalmology, Washington University, Saint Louis, Laboratory of applied Biophysics in Ophthalmology, Oscar Johnson Institute. Read at the third annual meeting of the Association for Research in Ophthalmology, New Orleans, May 10, 1932.

To one who has attached no preconceived special meaning to it, the term "light-sense" might mean any one of a great number of things. Essentially such an expression implies the capacity of the visual organs to see, and no measure of such capacity is possible in the absence of something which can fairly be called light-sense. Thus, not even the ordinary visual-acuity test with the Snellen chart or the like would be possible unless the end-organs of the retina possessed the power of responding in a specific way to the intensity and pattern of the light-image falling upon them. Yet the measurement of visual acuity is only one of an indefinitely large number of conceivable ways in which the capacity of the eyes to interpret light-stimuli might be appraised. Although the ways in which light-sense might be measured are legion, these methods would by no means yield results of equal value, either for clinical ophthalmology, or for the physiology of vision. We might at this point discuss some of the inherent facts of vision upon which this multitude of possibilities depends. In general, we may first subdivide them into two classes, and while this may not exhaust the possibilities it will at least indicate a viewpoint from which the subject may be approached.

(1) The simplest visual object, essentially requires four terms for its description[1]. In any measure of visual capacity three of these may, in general, be established, and light-sense may be measured in terms of the fourth.

(2) Unlike the other senses, vision depends for its function upon a medium which is neither determined by the object which vision must apprehend, nor by any activity of the organs of vision themselves, but which is, so to speak, accidentally present and wholly irrelevant in quality and intensity to either object or sense organ.

It will be worth while to elaborate these two propositions. (1) Consider first a letter on the test-chart. Let the chart be placed in a uniform light, so that every part of it receives the same *illumination*. The letters, which are the parts of the card that are covered with ink, absorb nearly the whole of the light which falls upon them and reflect, in fact, only about five percent. The unaltered white paper, on the other hand, reflects nearly all of the incident light, in fact about eighty percent. If we assume the *illumination* upon the card to be 1000 meter-candles (or about 100 foot-candles, which is quite possible on a table-top in front of a window), the *brightness* of the white portion of the chart will then be 80 ml. (millilamberts), and that of the inked parts 5 ml. Now the eye that sees the letters is affected in no way at all by the light which falls upon the test card. The eye is, however, under the influence of the light which is *reflected* from the card, which enters its pupil, and which proceeds in an orderly way to form an image of the card upon the pavement of sensitive nerve endings in the retina. And the light-intensity of the image at every point is in direct proportion to the *brightness*, due to *reflected* light, of the corresponding point on the card.

This leads us at once to two of the four terms necessary to describe a simple visual object, for we have here two factors representing the paper and the ink, or the background and the figure of the visual object which we are discussing. These are the two brightnesses involved, 80 and 5 ml., of the paper and

of the ink respectively, which are proportional to the density or thickness, as it were, of the light shed on the retina in the corresponding parts of the image.

Now let us suppose something which, though quite impossible to do, is easy enough to imagine. Let us suppose we have the power of fading the ink at will, so that its reflecting power, and consequently its brightness under the stated illumination, rises by known stages from five percent and finally reaches that of the paper, eighty percent. At this point, since there is no longer any inequality, the letter must become invisible. Let us think of one of the larger letters now, and stop this process when the ink is faded to a reflecting power of seventy-nine percent. At this point the letter might be barely visible. Thus the visibility of the object depends in a direct sense upon the *difference* between the two brightnesses. From this there follows a better way of stating these two than to give them both directly as we have just done. When the paper is at 80 ml. brightness, and the ink at 79 ml., the general level of brightness will not be greatly different from 80 ml. The brightness difference will be 1 ml., or 1/80 of this. We may accordingly say that the general brightness level is 80 ml. and the brightness difference is 1/80, which in one way comes to the same thing as saying that the two brightnesses are eighty and seventy-nine, but has the additional advantage that the visibility of the object increases directly with the level of brightness, and directly also with the fractional difference. The latter, it will be seen, is identical with the classical Weber-Fechner fraction, which expresses the ratio of the least perceptible difference to the magnitude of the stimuli compared.

The reference to figure and background will perhaps not always hold. For example, the measurement of the least perceptible brightness difference may involve the comparison of two halves of a limited field, in which case neither may be looked upon as figure or ground. Nevertheless, the two photometric quantities are there. Again, as in the measurement of dark-adaptation, the subject may be required to report the presence or absence of a dim patch of light. In this case the patch being the first photometric quantity, the second is understood to be the perfectly dark ground on which the patch is seen; that is, zero brightness. In such a case, the general brightness level becomes ambiguous, and only one term, the brightness of the patch, is stated.

The third of the four terms necessary to the description of a visual object is the area occupied by its image upon the retina. The external correlate of this is the *angular extent of the object in the visual field*, which is of course the main consideration in the use of the customary test-card, upon which the two brightness factors have been made as widely different as is practically convenient by the use of black ink and white paper. However, there is no test of visual capacity in which the extent of the test object is not significant. In determining the least perceptible brightness difference, a larger field makes visible a smaller difference between the halves, and in work in dark-adaptation, a larger field will yield a lower result as the threshold. Area and intensity are thus more or less supplementary to one another, indicating that there is summation of effect between neighboring retinal elements.

The fourth and last term is *time*. It is quite usual to measure the capacity of vision in one way or another without particular reference to time. This procedure carries with it the implication that what the subject fails to see in a very few seconds he will not see at all, however long he may stare at the test object; which is very close to the truth. But if we are dealing with fractions of a second, especially small ones, it is no longer true that the action-time of the stimulus is indifferent to the result. An object just visible with one half of a second exposure becomes invisible with one-fourth second, and the object has to be increased with respect to one or another of its descriptive terms, brightness level, brightness difference, or size, in order to bring it back to visibility. Up to a certain limit, then, there is a cumulative effect during the action time

of a visual stimulus and, within this limit, time and the other three of the four dimensions of the stimulus are mutually supplementary.

The study of the time relations in vision, and in other sense organs and in isolated nerve cells and fibers as well, has been a matter of great interest and has led to interesting results. These can not be gone into here, however, except to call attention to numerous implications of the term "light-sense", which they suggest.

To recapitulate: The simplest visual stimulus requires not less than four terms for its description, which may be referred to as its dimensions. The first two of these are photometric and are typically the brightness represented by the test figure and that represented by its ground. (Naturally, if color enters here, it has to be considered in connection with these.) These two may be equally well stated as a brightness level which will vary directly as the illumination, and as ratio of brightness difference, with the advantage that each of these two terms stands in direct relation to visibility. The third dimension of the visual object is its size, or area, perhaps best expressed as angular extent in the visual field; and the fourth is the action time of the object.

Within certain limits, these four are supplementary, in the sense that when one of them becomes too low for visibility the deficiency may possibly be compensated by an increase in one or more of the other dimensions.

For reasons of convenience, or to suit the conditions surrounding vision which we have chosen to investigate, any one of these four dimensions may be selected as the one which is to be the experimental variable. In any case, that one being experimentally reduced to the value at which the test-object is just on the point of visibility, the threshold is completely described only when all four are stated. Moreover, when this point is reached, each one of the four is at its threshold value, but only with reference to the fact that the other three are as specified, no one of the four being significant except in relation to the others. While there may be exceptions to this, it should be the rule, and no omission should be made in reporting the results until all four specifications have been carefully considered.

By reason of the facts which have just been discussed, it will appear that the number of different test objects, and hence the number of tests of light-sense that are possible, is enormous. Assuming that we are to make any one of these four dimensions the experimental variable, there remain three others to consider. If each of these is practically capable of, say, ten stages of variation, the three together yield the possibility of 1000 different test objects, any one of which might be selected for the work in hand.

Before we make this selection we will turn to another aspect of the situation.

(2) Unlike the other special sense organs, the eye in interpreting the objects which it sees is compelled to make use of a medium which depends neither upon the eye itself, nor upon the object which is seen. In contrast to this, we may consider the sense of hearing. In this case the sound arises, all but invariably, from the very object which is thereby apprehended. The sound is thus wholly characteristic of that object and its location. In vision, quite otherwise, the light is a medium which is, in a sense, accidentally present, and which seldom originates with the object seen; and it is an inconceivably variable medium, in color, and, above all, in intensity.

Daylight at midday we are accustomed to call "white". At the ends of the day, when the sun is near the horizon, it becomes distinctly red. When we go indoors at night, the light that we are accustomed to use is yellow or reddish yellow.

Noon sunlight has an intensity of about 100,000 meter candles. As this wanes, the organs of vision follow. The full moon yields about one-fourth of a meter candle; on a moonless night the earth receives about one one-hundredth, and human eyes are capable of seeing to some extent with a few millionths of a meter candle. And over a large part of this enormous range, which is represented by a factor of

thousands of millions, the eye goes on faithfully reporting small objects, and small differences in brightness—and faithfully ignoring large differences in color and tremendous differences in the general level of brightness, which are, of course, totally irrelevant to the matter which vision has to report.

Indeed we may well say that *it is an important function of the eye to ignore wide changes in the color, and especially in the intensity, of the flood of light which constitutes its working environment.* It has been said that the eye "can equate, but cannot appraise", and the appropriateness of that fact to the purpose of vision, and to the situations it has to meet, should be apparent. Possibly also, it explains why tests of light-sense often fail of any good purpose, and in particular, why it is often difficult to detect changes in visual capacity due to variations in the general light-intensity unless the latter are much more than moderate in extent.

There are two tests commonly used in clinical ophthalmology which, if not usually so called are, at least physiologically, tests of light-sense. One of these is the ordinary test of visual acuity with the letter chart. While this is used for the greater part in the diagnosis and correction of refractive errors, and may be the first indication of opacity of the dioptric media, an impaired visual acuity in the absence of any such physical explanation is an indication of an impairment of the light-receptive power of the retina or its nervous attachments, and the test is then properly a test of light-sense. Since, however, the test-card is designed primarily for other purposes, and is generally used only at fairly high brightness levels, it cannot be considered ideal for this purpose.

While in mapping the visual fields, color plays an important part, we shall see later that in considering the question of light-sense and its measurement, we shall not be able wholly to exclude color. It gets into the problem in spite of us, before we get far. On the other hand, the defects in the fields which are revealed by the perimeter are defects in light-sense from the broader viewpoint, and should not only be considered such, but should, along with central visual acuity, be considered in connection with the results of any other appraisal of light-sense. Meanwhile, the consideration of perimetry should remind us that a light test limited to central vision or to any single restricted part of the visual field, might easily fail to reveal defects which are actually present in other portions.

The research problem connected with the subject of light-sense should consist in looking about, with the considerations in mind which have so far been dwelt on, and with the established findings of physiological optics in view, for the purpose of developing new points of attack. A method developed on lines which seem promising in view of the recent past, may be put to work on both normal and pathological subjects. Results so obtained will show two things, which are fundamentally important for any test: first, what is the result obtained for the normal eye, and what are its limits of variation for different persons and for the same person at different times; and second, what pathological conditions show deviations from the normal, sufficient in constancy and degree to be surely differentiable from the normal. Only with a positive result as to the second of these, can the test be of clinical help.

The failure of a test to fulfil such a purpose is well exemplified by the simple measurement of the least perceptible brightness difference (the light-difference test) under an illumination sufficient to maintain a light-adapted state of the eyes. A cheap and fairly simple apparatus for this purpose is based upon the principle of fusion by means of the rotating disc, upon which a ring-shaped band may be made to appear which shall be darker than the disc by a specified fraction. However, as a practicable measure of light-sense, the brightness-difference method does not appear to have justified itself, whether conducted by the disc method just described, or by more elaborate photometric apparatus. Quite recently Derby,

Chandler, and O'Brien[2] have made such measurements on 204 eyes of 130 cases, ranging all the way from normal to advanced glaucoma. They find the least perceptible brightness difference to range, in the average, all the way from 2/100 in the normal, to 6/100 in advanced glaucoma. In the average, an increase of 200 percent. But there is so much variability in the same person from one time to another, and so much overlapping of results between the various groups, that they reject the test as not significant or useful in the diagnosis of early glaucoma. This quite bears out the experience of the writer and of other workers, for to obtain a measure of the threshold of brightness-difference which can be repeated, several hours of work are necessary, distributed over a period of days.

There are, however, certain modifications of the brightness difference test, which have never been adequately worked out. If the test field is presented, not by itself, out of comparative darkness, but in the midst of a surrounding zone which is much brighter than itself, the well-known phenomenon of contrast will be at work, and the test field will then, in a sense, become equivalent to a dark gray or black. This is exactly the same situation which arises when we sit indoors in a well-lighted room and look out the window into the night: the outside objects are thereby made to appear much darker by contrast, and are then much less easy to distinguish. Under these conditions, vision is working in a way very different from that of the reverse. For one thing, the fraction of brightness difference becomes enormously greater.[3] Possibly also, in connection with this form of test, there is something of value to be found out, perhaps by the comparison of the least perceptible brightness difference, say in the same field, with contrast darkening and without it[4].

If we leave the question of the least perceptible brightness difference, and turn to the least perceptible brightness, we come to a phenomenon which has long engaged the interest of students of the physiology of vision. We spoke some time back of the rather startling range of intensities under which vision is possible. Midday sunlight at one end of the scale, with its 100,000 meter candles of illumination, and the least intensity visible, some few millionths of a meter candle, at which human vision still operates to a significant extent. By the way, it must not be supposed that the processes of vision are identical at all parts of this range, nor that all these visual feats are possible within the same instant of time. Doubtless every one has noticed on entering a dark place, that the objects therein are at first invisible, and that they come into the range of vision after a certain lapse of time. The change which occurs during such a time has received the name of "dark-adaptation", and its course and extent may be more definitely mapped by an experimental procedure which is, in its essentials, comparatively simple. The requirements are a perfectly dark room, and within it the means of presenting to the eyes of the subject a patch of light, which is capable of being dimmed to an almost indefinite extent by known stages. The subject comes from the light into the dark room, and the least intensity at which he is able to see the patch is measured. From time to time this measurement is repeated. The threshold is thus found to decrease, at first rapidly, then more and more slowly; and it is only after the lapse of half an hour or an hour that the sensitivity of the eyes becomes stationary. It has been shown by this method that the sensitivity of the eyes in extreme cases may increase several thousand times during the course of complete dark-adaptation; and it is only after this period that it is possible to get a constant and stable value for the least perceptible brightness.

The estimation of the course and limit of dark-adaptation by a method essentially as described constitutes the only application which the measurement of light-sense has yet found to clinical ophthalmology. The physiological study of the process has come to touch on certain fundamental questions concerning color vision which it will be worth while to discuss here.

It was long ago noticed that in very dim light it is no longer possible for the eyes to distinguish different hues, objects appearing lighter or darker, but colorless, or at least without color differences. If a red and a blue object are selected such as to be about equally bright under full light, with the progressive dimming of the light and the corresponding dark-adaptation of the eyes, a time comes when the red will appear black, while the blue still retains a striking degree of luminosity. This observation was the first of a series which has made it clear that vision under full light and vision under dim light are two quite different processes[5]. The principal facts of the difference may be stated briefly and without going into theory.

Vision under full light has been called *daylight vision*, or *photopic vision* and, with the exception of the peripheral field, gives full recognition to all possible colors. It also mediates the clear vision of very small objects, this function being by far at a maximum in the fovea.

Vision under dim light, often called *twilight vision*, *night vision*, or *scotopic vision*, does not discriminate colors. As contrasted with photopic or daylight vision the spectrum appears all of one color, the brightest or most luminous part being shifted toward the short-waved region (the *blue* under full light) and the extreme red is seen neither as red nor as light but disappears completely. Under these conditions of dim light and dark adaptation it is found that a small area at the fovea does not respond at all: small dim objects vanish when directly fixated[6]. Partly as a consequence of this, objects are never seen sharply outlined under these conditions, but always appear vague and blurred. Extremely small objects, clear under full light, cannot be resolved at all, although with full dark-adaptation the larger objects may appear quite distinct.

These facts, taken in connection with the distribution of the rods in the retina, the association of the visual purple with the rods, and the behavior of visual purple toward light, have been made the basis of the so-called duplicity theory, or theory of dual function, which associates all of the phenomena of dim light or scotopic vision with the function of the rods; and the phenomena of full light or photopic vision, including its complete response to colors, with the cones, and possibly also the rods. We do not need to subscribe to this theory, however, to realize the far-reaching difference between these two phases of vision, and to draw what conclusions we can to apply to the study of dark-adaptation. The dark-adapted eye *is* the eye in the condition for scotopic vision, and those characteristics which differentiate the two phases are bound to make themselves felt as vision passes from the light-adapted to the dark-adapted state.

For example, from what has been said above, it should be apparent that the extreme red, at the long-waved end of the spectrum, since it disappears completely for the dark-adapted eye, while the rest of the spectrum is still visible, has a scotopic (or dark-adapted) valence which is negligible or nothing at all; while the rest of the spectrum remaining visible, has a significant scotopic valence, which, *relative to the photopic (light-adapted) valence*, is greatest for the extreme violet (short-waved) part of the spectrum. Thus it is legitimate to expect that the use of light from the extreme violet end of the spectrum in following the course of dark-adaptation will indicate an apparently much greater range of increase in sensitivity of the eye under examination than will the testing of the same eye with spectral light from the extreme red which, as we saw, goes out completely while the rest of the spectrum remains visible[7]. This leads to the conclusion that the selection of the quality of the light used is an important matter in work on dark-adaptation. Results will depend upon the relative intensities of the various waves in the spectrum of the source, and lamps differ in this respect. Indeed, the same lamp differs widely according to the voltage applied. Under reduced voltage, the blue end of the spectrum falls off more rapidly than the red, and the relative scotopic, or dark, valence of the total light is correspondingly re-

duced. A decrease in the apparent breadth of dark-adaptation will be the consequence.

This is a powerful argument for the standardization of method, if dark-adaptation is to come into general clinical use, even if that use is limited to hospitals and clinics. The first investigation of the subject appeared in 1865[8], and since that time there has been an accumulation of results both physiological and clinical. However, there have been numerous ways of stating and representing those results, in which each worker has almost been a law unto himself. Indeed, it is in some instances difficult to interpret any group of these results among themselves, let alone make comparisons with the work of another investigator. In going over this literature, one is led to the belief that the best technic, from this standpoint is the one which has been worked out by Dr. Derby and his associates at the Massachusetts Eye and Ear Infirmary of Boston[9]. While the primary interest of these workers has been the bearing of light sense on glaucoma, the technic they have evolved for the measurement of dark-adaptation is thoroughgoing and complete, so that this phase of the work may be taken by itself. The essential points are embodied in the following, which contains also some comments of the present writer:

(1) The pupil. As the quantity of light reaching the retina is determined, among other things, by the pupil, it is necessary for comparable results that the pupil should not vary. The first step in this method is therefore the fixation of the pupil with pilocarpin.

(2) Pre-exposure. The rate of dark-adaptation depends upon the prior exposure of the eyes to light. This is made constant by having the patient sit for ten minutes looking at an extended white surface illuminated to a standard brightness of about twenty millilamberts.

(3) The light used in the adaptometer should be standardized as to color, or should at least be the same for all results which are to be intercompared. The method used for reducing the light intensity should be such as not to alter its color or spectral distribution. Reducing the intensity by changing the current in the lamp is not permissible.

(4) The "final" value of the threshold is its constant value and this is usually attained in somewhat less than an hour. This and other values of the threshold should be known and stated in strictly photometric units.

(5) Correction for pupillary area. The pilocarpinized pupil of the subject is measured and the threshold values obtained are each corrected to represent the brightness of external surface which would yield equal intensity at the retina with a "standard" pupil of 5 mm. diameter. The width of the pupil is thus eliminated as a factor in the result.

The aim in devising a method for the measurement of light-sense is the detection of possible impairment in the sensitivity of the light-perceiving end-organs; such circumstances as are in- is important that we should not be misled by such variations in result as are to be found among normal individuals, and much more, that we should be sure that an abnormal result has not arisen from some circumstance which has nothing whatever to do with the end-organs; such circumstances as are indicated in precautions given above.

While the practice of measuring dark-adaptation is a time-consuming one, situations arise in which it may become an important datum either for diagnosis or prognosis. Light-sense has been found definitely impaired in a large variety of clinical conditions[10], of which more at another time. At present, it has been the aim rather to discuss the fundamentals of the subject.

Summary

1. The term "light-sense" taken broadly has as many meanings as there are possible methods of measuring it.

2. This is due in part to the fact that any visual object, or test object, requires at least four terms for its complete description.

3. These are: two photometric terms, the brightness of the figure, and the brightness of its background, which often may conveniently and adequately

be expressed as brightness level and brightness difference; third, the size of the object, best expressed as its angular extent in the visual field; and fourth and last, the time of action of the object.

4. The fact that any and all of these terms or dimensions may be varied by many stages gives rise to a legion of possibilities from which a selection of test object must be made.

5. Since the eye works by means of a medium, the light, which changes enormously from time to time, it may be said that an important function of the eye is to ignore changes in this medium, which are irrelevant to the interpretation of objects seen.

6. Tests of light sense which have been tentatively applied to clinical ophthalmology are the brightness difference test and the dark-adaptation test. Experience with the former has, on the whole, been unpromising by reason of the wide and irregular variability of the results.

7. The subject of dark-adaptation leads directly to the fact that there are two distinct phases of vision, corresponding respectively to vision under full light, with the discrimination of colors, and to vision under dim light without color discrimination. These two phases have been theoretically referred, the former to the activity of the cones (with the possible participation of the rods), and the latter to the activity of the rods alone.

8. Regardless of theory, the dark-adapted eye works in the second of these two phases, and work with dark-adaptation should take full account of the known laws of scotopic vision.

9. The literature of dark-adaptation shows a confusing number of different technics and ways of stating results. Certain essential details of method and essential precautions are enumerated, looking toward uniformity, and toward the eliminating of variability in the results due to nonessential factors.

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ULTRAVIOLET LIGHT IN OPHTHALMOLOGY

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The most useful rays are in the neighborhood of 2800 A.U. The treatment of ulcers of the cornea is the especial field for ultraviolet light. For some of these ulcers this therapy is remarkably beneficial. From the Department of Ophthalmology, Washington University, Saint Louis. Read at the third annual meeting of the Association for Research in Ophthalmology, New Orleans, May 10, 1932.

Ultraviolet light as a therapeutic agent in ophthalmology has been given favorable comment in the literature for many years. As a consequence many clinicians are now interested in the subject, but the practical application is still not generally understood. In this paper it is intended to consider the nature and some of the properties of ultraviolet light, followed by a presentation of the requirements for its use in the local treatment of ocular disease. A discussion will then be given of some of the commercial sources of ultraviolet light and the technic employed in its application. Finally a few clinical cases will be described, demonstrating that it does seem to have a place in ophthalmic therapy.

Ultraviolet light is a form of radiant energy occupying that part of the spectrum immediately below visible light, beginning, roughly speaking, at a wave length of 4000 A.U. and ending at 2000 A.U. It induces certain specific reactions that are different from those obtained from any other form of energy. Perhaps the best known of the biological responses is the erythema produced in the skin after exposure to the rays. This usually appears several hours after irradiation, then gradually disappears and in its place there develops an increase in pigmentation. These changes are spoken of as a photochemical reaction, a process always requiring a certain lapse of time in contrast to the erythema arising from heat which occurs almost immediately.

In addition to the delayed skin reaction there are other biological evidences to the activity of ultraviolet light. It has been shown[1] that blood coming from the region of recently irradiated skin has an increased nonspecific bactericidal power as compared with that from another region or from the same region before irradiation. The skin itself has also shown a certain immunological activity exceeding that manifested before exposure. A more far-reaching influence on the body is the well-known action of ultraviolet light in the prevention and cure of rickets.

Other examples of the influence of these rays might be adduced but the few here mentioned will serve to indicate that it can modify living processes. It might be of more interest, instead, to go a step further and consider the cellular reactions to the rays, in which respect our purposes will best be suited here if we restrict the discussion to the tissues of the eye.

It may be stated first that the histological appearance of the cornea following irradiation is so constant and so characteristic that the diagnosis of ultraviolet reaction can be made by the histological section. This has been repeatedly demonstrated, most recently by Duke-Elder[2] with a clarity that cannot be questioned. After irradiation of the cornea the epithelium shows the greatest, the substantia propria somewhat less, and the endothelium, although similar in nature, the least change of all. Basophilic and eosinophilic granules appear in the cells, a change that is consistently observed after exposure to the rays, the process eventually resulting in the death of the cells, provided that the amount of irradiation has been sufficient. The histologic picture depends upon the interval of time that has elapsed after the exposure, as well as upon the amount of energy absorbed, for as has already been said, the response is in the nature of a delayed reaction.

The lens epithelium shows the same

changes but less in degree, because of the relatively small amount of energy that reaches it. With high intensities of radiation it is even possible to show changes in the nuclei of the lens substance. There is evidence, however, that even smaller amounts of ultraviolet light, alter the metabolism of the lens, which in a diseased eye is probably already disturbed, and may give rise to subsequent opacities; a fact the clinician would do well to remember.

The action of ultraviolet light on the iris may be dismissed with the statement that whatever energy reaches it is entirely absorbed by this pigmented membrane, so that any abiotic effect that might be produced there would be masked by the heat reaction.

There seems to be some question about the occurrence of changes in the retina, but Duke-Elder has presented evidence which he interprets as being proof of the abiotic action of ultraviolet light in this tissue. Verhoeff and Bell[3], however, found no retinal changes even after extreme exposure to ultraviolet light. One may at least feel assured that under ordinary exposure the retina will suffer no damage. It will be shown in a moment that the cornea and lens together absorb almost all of these rays, thereby shielding the retina.

Before considering the possibilities and mode of healing in the eye, it would be well first to mention the transparency of the various ocular media to the different wavelengths of ultraviolet rays. Ultraviolet light can be divided into two spectral bands, using the wavelength 3000 A.U. for practical purposes as the line of division. The shorter waves, those between 2000 and 3000 A.U., are much more active chemically and biologically than are the long waves, and hence have been named the abiotic waves. This fact is very important, for there is a marked difference in the transmissibility of these two bands through the ocular media; their intensity also differs greatly with the various generators used.

The cornea absorbs the short-waved band almost entirely, allowing the longer waves to pass to the lens. This long-waved band is largely absorbed by the lens so that practically no ultraviolet light reaches the retina[4]. The aqueous and vitreous are relatively transparent to the rays and can be disregarded in this discussion.

The Grotthus-Draper law states that radiant energy must be absorbed in order to produce a reaction. This fact correlated with the transmissive properties of cornea and lens determines the physical possibilities of ocular therapeusis with ultraviolet light; that is, their limitation to external ocular conditions. While treating of the relative transparency of the ocular media, it would be pertinent to mention, at least briefly, the subject of infrared radiation. Sources of ultraviolet energy are usually rich in a supply of heat waves and the ocular media are of such transparency to infrared rays as to make this part of the spectrum dangerous. Without going into further detail I may say that it is believed that all infrared energy should be filtered out when treating the eye with ultraviolet light.

It is not clearly understood how ultraviolet energy influences the living tissue to promote healing in the presence of disease, but we do know that the absorption of a sufficient amount of ultraviolet energy by a tissue results in the destruction of the individual cells, and that a sublethal exposure causes changes recognizable microscopically, as has already been mentioned. The available evidence indicates that this absorption or transfer of energy alters the electrical pattern of the atomic systems of the cellular elements. As a possible example, it is now well known that certain substances take on the properties of vitamin D after irradiation. When this photochemical modification of cell metabolism has been explained we shall probably also know more about the healing effects that have been observed.

Besides the primary effects, there are secondary activities that no doubt play a definite part in healing: (1) Irritation of the cornea or conjunctiva induces hyperemia with its consequent improvement in nutrition; (2) large quantities of eosinophilic cells migrate

to the region; (3) the superficial cells of the epithelium are destroyed by irradiation and slough off taking with them some bacteria. It has been demonstrated repeatedly that ultraviolet light is quite lethal to most microorganisms but because of the rapid absorption of the rays by the cornea it is unlikely that more than surface bacteria are destroyed.

The question arises at this point as to whether certain wavelengths are associated with or produce specific responses. It appears that in general the short ultraviolet waves are merely much more active than the long waves and in local ophthalmic use nothing beyond this has been clearly demonstrated. However, with respect to the general irradiation of the body, it has been shown that the energy in the neighborhood of 2800 A.U. is most effective in the cure of rickets[5], and in the production of vitamin D. Since all substances have their own individual properties of absorbing radiant energy and in the case of ultraviolet light, at least, this is probably linked up in some way with the atomic systems of the tissues, we have here undoubtedly a promising field of investigation.

Clinical experience teaches that, in general, inflammations of the external eye are the conditions that react favorably to ultraviolet therapy. This fact along with the above theoretical considerations determines the requirements for the application of this form of radiant energy to ocular disease. An inflamed eye is an irritable eye, and this immediately suggests the minimum amount of manipulation and exposure consistent with an accurate dosage. If the period of exposure be limited, it follows that to obtain a sufficient amount of irradiation the intensity of incident energy must be increased. When dealing with as delicate an organ as the eye, and with as powerful an agent as ultraviolet light, it is necessary that the source and mechanism be constant in operation and readily controllable.

The mercury arc in a quartz tube meets the theoretical requirements in a source of ultraviolet light better than any other generator. Its spectral distribution of energy is such that the proportion of short-waved ultraviolet light is high, while the proportion of visible light and infrared rays is low; that is, in comparison with the carbon arc. The mercury arc is, besides, far more constant in operation and requires no adjustment; it can, moreover, be compactly built in a water-cooled chamber, both these factors giving it additional advantages over the carbon arc.

Having selected the most desirable generator, the next step to be considered is, how may the energy be applied to the eye? The most convenient method is by means of a system of quartz lenses, the burner and lenses so arranged as to form a projection lantern. With the affected eye at the focal point of the apparatus, one has a standard working distance. Within the lens system filters may be inserted and also variably shaped apertures so that the beam may approximate the configuration of the area requiring treatment.

The amount of visible light and radiant heat from carbon and mercury arcs is so great that the eye must be protected. This can be done conveniently by using filters that will eliminate glare and heat and still permit adequate transmission in the short ultraviolet range. Distilled water happens to be an excellent filter for the infrared rays; and the Corning Glass Works of New York now make a glass known as Red Purple Corex A that transmits as much as 85 percent of the energy at 3000 A.U., 50 percent at 2800 A.U., and even 10 percent at 2600 A.U. At this point there is a strong emission band in the mercury arc, yet this glass allows but a very small amount of visible light to pass. Thus the clinical use of ultraviolet light has been made much more comfortable with the removal of the intense glare that has always been so objectionable. Another glass known as Uviol glass has also been put on the market for such purposes, but it absorbs all the short-waved ultraviolet light; consequently the time of exposure has to be increased to a point where it is impracticable.

The equipment that the author has been using consists of a Bausch and Lomb ultraviolet radiation lamp in which the carbon arc has been replaced by a water-cooled mercury arc lamp. The Burdick lamp was selected as being the most desirable because the water in the cooling system does not circulate between the burner and the window, thus avoiding a precipitation on the window which would in time diminish the intensity of the radiation. A second reason for this selection is that the window is made in the form of a chamber filled with triple-distilled water between quartz plates. This heat filter has been found adequate; it is cooled by the water-cooling system and, being sealed, is constant and dependable. The fitting together of these two pieces of apparatus is simple and requires but one minor adjustment.

The Bausch and Lomb part consists of a metal tube on an adjustable base that rests on a glass-topped table. A quartz condensing lens is mounted in front of the arc and a focusing quartz lens is placed at the other end of the tube. An iris diaphragm is mounted between the lenses in such position that its image is focused on the tissue, and thus the size of the radiated circle may be changed without altering the intensity of radiation. Filters and variously shaped apertures may also be introduced into the tube; a quartz plate with a central opacity is provided to throw a shadow on the pupil and thus protect the crystalline lens.

The Zeiss Company manufactures a radiation lamp (Birch-Hirschfeld) similar in principle but using a carbon arc as the source of energy.

Recently there has been placed on the market a lamp of different design. It is an electrical-discharge tube suggesting somewhat a neon sign. A hollow quartz tube about eight inches long encases a smaller tube which extends nearly the entire length of the outer tube. The discharge appears immediately after the electric circuit is closed, filling the tube and radiating with sufficient intensity from the sides and tip. The apparatus operates on an alternating current which is sometimes an advantage, for the direct current is not always available. The mercury arc requires a direct-current supply, and the carbon arc also burns best with direct current. This new lamp, marketed under the trade name of "Cold Quartz," for it does not become heated, is also conveniently portable.

When treating the eye, radiation from the tip alone is used, the tube being covered with a stockinglike sheath. The tip is held near the lesion during the exposure, which, it is true, permits of considerable inaccuracy as to dosage, but from the reports of Nugent[6], gives results that are clinically satisfactory*. The intensity of its radiation at the tip, using the zinc-sulphide method of determination, was such as to give a minimal erythemal skin reaction in fifteen seconds.

The technic employed in operating the writer's mercury arc lamp is as follows: The patient is seated at the glass-topped table with the head in the chin rest. The lamp is started and after about four minutes burns at a constant voltage. The glare filter is in place, and, in addition, there is a clear glass filter to block the ultraviolet rays until the moment of treatment. With the diaphragm cut down, the light beam is brought to a focus upon the lesion, and then the diaphragm is opened, so that the beam includes slightly more than the area involved. The clear glass filter is now removed for the period of treatment which is accurately timed by an interval timer or laboratory clock.

If instead of the mercury arc the carbon arc is to be used with the apparatus, the technic is similar. The carbon arc must, however, be closely watched and frequently adjusted in order to insure a constant intensity of radiation. This varies considerably when measured by such an instrument as the Burt photometer, but the average intensity during the exposure is satisfactory for clinical purposes.

In general, the duration of exposure is fifteen seconds when using the writer's apparatus. This dosage was adopted

* It appears, however, that for corneal ulcers he still uses the Birch-Hirschfeld lamp.

when it was found to be just suberythemal for the average, moderately fair skin, tested on the under surface of the arm. Applied to the human cornea, it always produced a mild to moderate photophthalmia within six to eight hours, which is the classical reaction. A sixty second exposure of the human cornea produced no harmful local effect, but the subjective reaction was very unpleasant. Rabbit's corneas showed no permanent damage either clinically or histologically even after a five-minute exposure.

Duke-Elder recommends establishing the dosage by first determining the skin sensitivity of the individual to ultraviolet light. This procedure delays the treatment for a day and seems to me unnecessary, because the cornea is a non-pigmented tissue and would not necessarily make the same responses as the skin. Regardless of complexion, corneal tissue is the same in all individuals. Moreover, one would not expect the cornea to develop tolerance to ultraviolet light in the same manner as does the skin. A certain tolerance, however, does seem to develop, but it is small. Experience has shown that the fifteen-second dose is practical and the only difference in response from patient to patient has been subjective. I have not been able to correlate this in any way with the complexion. Sometimes the dosage has to be reduced for hypersensitive patients.

It has been shown that exposures during a twenty-four-hour period are cumulative, so that repeated treatments on the same day are unnecessary[8]. After three days the local biological effect has worn away and it has therefore been the writer's practice to use a maximal dose (suberythemal) every three days. Theoretically this plan would seem to be the best, and in practical application it has proved satisfactory.

The duration of exposure required by the carbon arc when using the same glare filter but a larger water filter (because of the greater proportion of heat), is longer than the fifteen-second dose of the mercury arc. If the carbon electrodes are cored with metals the intensity of the short-waved ultraviolet rays will be altered; nor is the intensity the same with the two types of current, direct or alternating.

A simple method of measuring the intensity of ultraviolet light is that described by Janet Clark[7] who uses as a photosensitive substance a specially prepared zinc-sulphide powder made into a paste and spread on a quartz plate. It has the property of reacting only to the spectrum between wavelengths of 2500 and 3200 A.U., which closely approximates the spectral band in which we are interested.

As has been stated, ultraviolet light is, in general, effective in the treatment of pathological conditions of the external eye. Since the cornea absorbs all of the abiotic rays it would be useless to attempt the direct treatment of intraocular disease. No contraindications for the utilization of ultraviolet light have been reported, except in the case of luetic interstitial keratitis, which seems to be unfavorably influenced by it. As to incompatibilities, there are none. My own purpose has been chiefly to discover whether ultraviolet light has therapeutic properties and in selected cases I have used no other therapy except atropin when indicated. I do, however, agree with other clinicians that in ordinary practice ultraviolet light should be considered an adjuvant therapeutic agent. The most promising field no doubt is the treatment of corneal ulcers. It has often a startlingly favorable effect on their course, and brings about healing with minimal scar formation—certainly a very important factor.

There are adequate reports of clinical results in the ophthalmic literature to furnish evidence of the value of ultraviolet light, but in order to round out this paper the following three brief case reports are appended. These cases have been chosen not in the spirit of overenthusiasm, but because of the apparent decisiveness of the action of ultraviolet light. They may encourage others to inquire further into this interesting field of ocular therapeutics.

Case I. Miss H. W., aged 19 years, was seen in consultation for the purpose of considering the use of ultraviolet light for her condition. Three weeks

previously a marginal corneal ulcer had developed in the left eye and had gradually encircled the cornea. The etiology could not be determined by exhaustive physical and laboratory examinations. In spite of intensive treatment the ulcer spread and at the time of consultation the eye was violently inflamed, the ulcer having made a complete circle just within the limbus. Four ultraviolet light treatments were given over a period of two weeks, all other therapy having been discontinued except atropin which had been used from the beginning. On the day following the first exposure the eye was less painful; after the third treatment the ulcer did not stain and within three weeks the eye appeared normal except for a faint circular scar suggesting an arcus senilis. Vision had returned to normal. At this time the other (right) eye showed a marginal ulcer, symptoms having developed on the preceding day. The ulcer extended from "2 to 5 o'clock". One dose of ultraviolet light was given. This was the only therapy administered. Three days later the ulcer did not stain and the patient has had no other corneal ulcers in over a year's time.

Case II. Miss C. M., aged 27 years, had a corneal condition that was diagnosed tuberculous keratitis from the appearance of the cornea itself, but the diagnosis was never proved. According to the patient, vision had gradually failed in the right eye over a period of about three months, and had then remained stationary for the last three months before examination. Other than the loss of vision, no ocular nor general symptoms appeared. Before the present trouble vision was said to have been good in the affected eye, equal to that of the other eye. The unaided vision of the right eye was 6/30, and of the left 6/5. The right cornea showed a patchy infiltration distributed throughout the substantia propria. A week later the vision and condition were unchanged, no treatment having been used. Ultraviolet light was then applied eight times over a period of four weeks, during which period vision improved to 6/7.5 and objectively the corneal infiltration diminished. Continued application of this therapy produced no further improvement in the vision.

Case III. Miss A. J., aged 18 years, was first seen by a colleague February 16, 1932. She had phlyctenular keratitis of both eyes with characteristic photophobia and lacrimation. Local treatment with atropin, warm compresses and antiseptics for over a month failed to bring relief. On March 21 the patient was seen in consultation and ultraviolet light was applied. Three days later her subjective improvement was striking. The lids of the right eye were open and there was but little tearing. The left eye, which had been the worse, was also definitely improved. With four treatments over a two weeks' period the right eye became quiet, showing no signs of inflammation. The left eye was still slightly photophobic when the treatments for technical reasons had to be abandoned.

Summary

1. The nature and properties of ultraviolet light are considered, giving particular attention to its effects on the tissues of the eye, its possible modes of action in therapy, and its physical limitations.

2. The requirements for local treatment of the eye are discussed together with a description of commercial ultraviolet lamps. The author's apparatus, using a new filter, provides a constant, intensive ultraviolet beam having the characteristics requisite for ocular therapy.

3. A safe but adequate standard dosage for cornea and conjunctiva has been determined and practical methods are presented for measuring the intensity of radiation from ultraviolet lamps.

4. The therapeutic application of ultraviolet light is illustrated briefly in three cases of corneal disease.

I wish to express my grateful appreciation to Dr. Harvey J. Howard, Professor of Ophthalmology at Washington University, for his help and encouragement in the study of this problem and of his readiness to make provision for the apparatus required.

824 Metropolitan building.

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[7] Clark, J. Amer. Jour. Hygiene, 1929, v. 9, p. 646.

Discussion: DR. W. B. LANCASTER: Will you tell us just how infrared damages the eye.

DR. HILDRETH: Dr. Verhoeff and Dr. Bell in their work showed that the effect on the retina was a heat reaction, that the pigmented layer absorbed all incident energy and changed it into heat. It is concentrated and damages the adjacent layer of the retina, the layer of rods and cones. Duke-Elder's work demonstrated the same effect.

DR. LANCASTER: How does the heat affect the lens?

DR. HILDRETH: The heat effect on any of the tissues of the eye, the lens as well as others, is a direct killing effect. The tissue becomes soft; histologically, there are signs of degeneration that are characteristic of heat reactions, The lens by its position seemingly, is unlikely to suffer except under a very extraordinary laboratory exposure.

DR. W. H. WILDER: I would like to ask the essayist what results were obtained in cases of interstitial keratitis and why isn't ultraviolet indicated in that condition?

DR. HILDRETH: The only answer I have to that is that the experience of other clinicians using this form of therapy has been reported as unfavorable. I haven't found any answer to your question. Because of their reports, I have never tried it myself.

QUESTION: Is there any change in the bacteriological flora in the eye, in the ulcer?

DR. HILDRETH: Dr. Verhoeff showed clearly that bacteria in the cornea itself, the stroma or in the anterior chamber, were absolutely unaffected. Cultures were the same after exposure as before exposure. I know of no work which has demonstrated that the flora itself has been changed.

DR. W. B. LANCASTER: Have you had any experience with corneal dystrophies?

DR. HILDRETH: I have had two cases that were seen in consultation. The exact nature of the condition was uncertain but they were regarded as cases of corneal dystrophy. In these cases, with the use of the light over a period of about a month, there was considerable ingrowth of new vessels at the site treated. I treated approximately one-fourth of the cornea, and that region alone showed a new growth of vessels. Whether there was any effect directly from the use of the ultraviolet or whether it was secondary to the increased nutrition by the ingrowth of the vessels, we were not in a position to decide.

DR. A. W. MCALESTER: What effect has the ultraviolet on vernal catarrh?

DR. HILDRETH: I treated one very severe case of vernal catarrh. By severe, I mean that the gross appearance of the conjunctiva was extreme and the follicles were very large. Subjectively, the patient seemed to be improved during the course of treatment but there was no objective change whatever. In a few less severe cases, I felt that there was no real improvement. The patient's subjective reaction was our only guide and that is so unreliable that I was unwilling to accept that as being evidence of improvement.

THE TRANSMISSIVE PROPERTIES OF TINTED LENSES

W. W. Coblentz
WASHINGTON, D.C.

The essential facts of the tinted-lens question are given and the subject clarified and simplified so that the ophthalmologist may know what tinted lenses can and cannot do, in transmitting light. Read at the third annual meeting of The Association for Research in Ophthalmology, New Orleans, May 10, 1932.

Part I. Discussion of advertising claims

Is standardization of tints needed?
"They increase visual acuity"
"They eliminate glare"
"They do not distort colors"
Are tinted lenses habit-forming?
How many shade numbers are needed?
Specification of the transmissions of different shades.

Part II. The transmissive properties of tinted lenses

1. Colorless glasses
2. Neutral-tint glasses
3. Amber and yellow glasses
4. Yellow-green glasses
5. Sage-green, blue-green glasses
6. Blue glasses
7. Amethyst glasses

Part I. Discussion of advertising claims

In view of the situation that has developed during recent years in the exploitation of tinted lenses it seems futile to attempt to discuss their transmissive properties without taking cognizance of a few of the extravagant claims, made in the advertising literature, concerning their optical properties.

Some of these claims seem to be the result of lack of information, while others are based upon unproved theories. In fact during the past year or so the situation has approached close to what, in common parlance, is called a "racket." For example, one advertiser proclaims that his lens has unique properties, for example it is "non-habit-forming". Thereupon all the rest appear to be obliged to assure the public that their lenses are "non-habit-forming". No wonder that part of the public has become indifferent, while others, through fear, do not wear tinted lenses lest they form the "habit"—whatever that means. For the advertiser has never explained whether the "habit" is a form of narcotism, or some other insidious physiological effect.

An even more insidious assertion that has been going around, apparently passed along orally by high-pressure salesmen, is that the elimination of the "peripheral rays" (meaning the wavelengths at the ends of the visible spectrum) produces an atrophy of the retina. If this is true it is extremely important that the fact be promptly established. As will be shown presently, after searching for over two years, and after conferring with renowned authorities, the writer has not been able to find an affirmative reply.

It is interesting to recall that the original inquiry regarding the truth or falsity of the alleged claim of atrophy of the retina came from an ophthalmologist in northwest Canada, who, at my urgent request, subsequently traced the rumor to its source and found that it was based upon an unproved theory of a high-pressure salesman.

The northwest seems to be a fruitful field for the promulgation of unproved theories. Some years ago an inquiry was received from an ophthalmologist in Colorado, who was approached by two salesmen, the one claiming that the presence of ultraviolet in daylight is injurious to the eye while the other claimed that the presence of ultraviolet is necessary to keep the eye healthy. After we had analyzed the motives back of these claims we found that the former vendor sold lenses that absorbed practically all the ultraviolet, and the latter sold a "non glare" glass that transmitted the ultraviolet as freely as the ordinary white crown glass lenses that are in universal use. In other words, the sales claims fitted the lenses, whether or not they fitted the physiological facts.

As noted in the next caption, another question that requires consideration by ophthalmological research organizations is the indiscriminate marketing of tinted glass under all sorts of trade names.

As is well known to the manufacturer of colored glass, unless extreme care is taken in mixing the proper proportions of the ingredients, and in melting the product, he will not get the same color when he makes a new melt. Innumerable shades and tints are therefore available, and it is possible to pick out a new tint from the scrap heap, give it a trade name, formulate a theory why it should be worn, and advertise it.

Is standardization of tints needed? From the foregoing considerations it is evident that a system of labeling is needed, so that the eye physician may know what color or tint he is prescribing. For instance, a recent production, "Acutone", appears to be simply a trade name for a light-colored uranium-yellow glass, that has a beautiful fluorescense, and for this reason, has been in use, for years, in physics laboratories to view the ultraviolet spectrum. "Azurlite" is a little more descriptive of a pale blue-green glass; and a recently produced "no-glare" is not unlike Crooke's "light sage green".

Some months ago an inquiry was received regarding the effect of tints of glass lenses upon the eye. The inquirer listed 13 kinds, including "Softlite". "Soft ray", Velvet lite", "Roselite", "Old rose", "Luxfel", and (evidently realizing the infinite variety of tinted lenses that are possible) "any other specific tinted or colored lens—all the above in various shades of each color". If he were writing today he could include an additional name "Pink Diantholite[1]". No wonder there is a demand among opticians for simplification, and standardization.

Ophthalmological research is confronted with the question of writing a specification of what is needed, rather than accepting what is advertised, as seems to be the situation at present.

"They increase the visual acuity." As is well known the eye is not achromatic, and in order to increase the visual acuity the lens must transmit only a narrow band of wavelengths. This is not true of tinted lenses. In some establishments (for example, engraving) attempts have been made to increase the visual acuity by using a lamp that emits predominately a single wavelength; for example the Cooper-Hewitt low-vapor-pressure, mercury-vapor lamp in a long glass tube, which has a dominant emission line in the yellow-green.

In connection with the use of tinted lenses the term "visual acuity" seems a misnomer. What is accomplished, if anything, is an increase in visibility by the elimination of scattered light of short wavelengths by absorbing it by means of a suitable glass. This is well known to the photographer, who, in order to photograph a distant landscape, eliminates the intervening haze of scattered blue light by using a rather dense amber-colored glass in front of his camera lens. In this way he increases the visibility by absorbing the scattered blue and violet rays, thus revealing the background.

By using a light azure-blue glass the vibility of distant objects remains unchanged or is decreased, instead of being increased. This may seem questionable; but a thorough consideration of the optical phenomena involved, and a view of the landscape at a distance of from two to three miles, as seen through a light-blue glass, will substantiate this statement.

The writer has made the so-called "visual acuity" test on the various herein-described tinted lenses, on a hot day (January 14, 1932) with bright sunshine and a hazy atmosphere, which obscured large buildings, smokestacks, and other conspicuous objects situated across a flat valley, three miles distant.

Tests were made also on a traffic sign ("12 mi. per hour"; white on a black background) and buildings of red brick, laid in white mortar, near his laboratory.

As can easily be verified by others, and as was to be expected, the writer and his assistant found that only the dark shades of the glasses that absorb the violet end of the spectrum increased the visibility ("the seeing") of details

of objects which were obscured by the blue haze. The light shades ("O", "A", see figs. 1 and 2) that transmitted sixty-five to eighty-eight percent of the light did not increase the visibility sufficiently to warrant their use for increasing the "visual acuity" of objects obscured by blue haze.

"They eliminate glare." Perhaps the glass that transmits eighty to eighty-

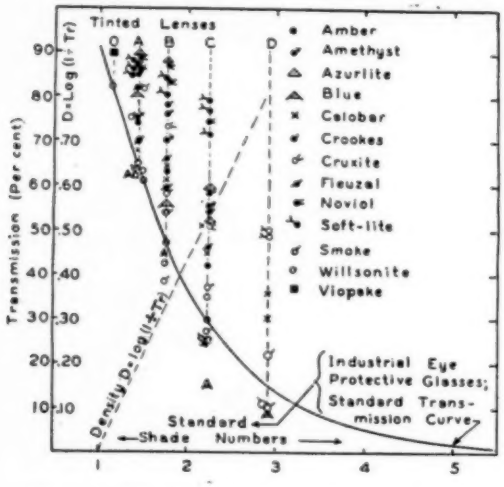

Fig. 1 (Coblentz). Comparison of transmission of shades A, B, C, D of different makes of tinted glasses.

five percent does eliminate glare for weak eyes that cannot tolerate an intensity stronger than skylight, shining through a window. But what will the wearer do when he attempts to mount a light-colored stone stairway that faces southward and is illuminated by blazing sunlight, amounting to 9000 foot candles? That is real glare and he will then need a shade-C glass, which will be none too dark to absorb the glare and permit him to see the steps, and to mount or descend them in safety.

Of course, as a sales proposition it would be desirable to have the wearer purchase two or three shades of lenses to meet these emergencies. But not many persons will be willing to carry three shades or even two shades of tinted lenses to mitigate glare. Hence the proper procedure appears to be to prescribe a shade-*B* or shade-*C* (or even darker) glass to meet all conditions.

Many of these glasses are of such light shades (transmission eighty to ninety percent) that they cannot eliminate glare when really encountered. Dark glasses are needed to eliminate intense glare.

These light shades show no color except when viewed edgewise, and, in that respect, are no better than common window glass (see figs. 2 and 8), which appears greenish when viewed edgewise, and absorbs more of the infrared than some of the glasses depicted in figure 2.

To restate the case, for the chronic sufferer from glare the light shade that is satisfactory for a glare of threshold intensity will not be dark enough for very intense glare. On the other hand, the average person needs dark glasses only for intense glare.

"They do not distort colors." As shown in figure 2, which gives the composite transmissions of a number of so-called tinted lenses, which, in the light shades examined, show little or no absorption

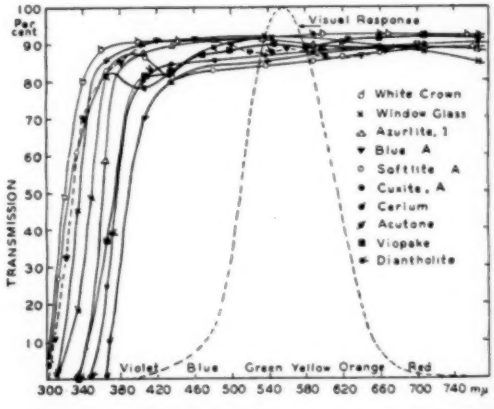

Fig. 2 (Coblentz). Showing the composite transmissions of a number of so-called tinted lenses, and the visual response curve of the eye.

in the visible spectrum, the assertion that they do not appreciably alter color values is substantially correct. This is owing to the fact that the glasses are practically colorless.

But a glass that is sufficiently dense (shades B, C) to protect the eye from glare effectively, usually exhibits selective absorption of the visible rays, which may alter the colors. The smoke-

glasses, which have a fairly uniform transmission throughout the visible spectrum (fig. 3), cause the least distortion of colors such as one encounters out of doors.

As is to be expected from an analysis of the transmission curves (figs. 10 and 11) on viewing flowers and vegetation through shades *B* or *C* of Amethyst and Soft-Lite glasses, which have a deep absorption in the blue region of the spectrum, the greens and blues appear darker, while the yellow, orange, and red tints are accentuated.

The amber and brown glasses which absorb the blue and violet, flatten the yellows and intensify the reds.

The dark blue-green and greenish-yellow glasses (Calobar, Willsonite, and others) which absorb the violet and the red end of the spectrum, accentuate the green in vegetation. The dark shades remove the red from purple and red flowers, which appear a dark brown or almost black. White flowers (chrysanthemums) appear bluer or tinged with yellow.

As is to be expected, dark shades of these various tinted lenses necessarily alter the color values. But this is not a serious question, even in the matter of traffic signals.

Are tinted lenses habit-forming? During the past year or more advertisements of tinted lenses have been replete with assurances that they are "non-habit-forming". As already stated, when one advertiser made the claim, others were forced to do likewise.

Apparently the claim is not so sinister as it would appear from the bare assertion that "X-lite" and "Twilite" lenses are "non-habit-forming", and, by inference, that other tinted lenses are habit-forming.

When forced into an explanation of what is meant by "non-habit-forming", the usual reply is that the particular tinted lens advertised does not accustom the eye to being without any spectral rays, and that one can cease wearing glasses without discomfort.

As already mentioned, in view of the question raised by an ophthalmologist as to whether tinted lenses produce atrophy of the retina, for over two years the writer has been searching for evidence and has found none. When traced to the source, the original rumor was found to be based upon an unproved theory and not upon observation. Even the inquiries regarding atrophy of the retina caused by ultraviolet light, incident on the retina after removal of the crystalline lens (cataract), elicited the information that, in cases of cataract,

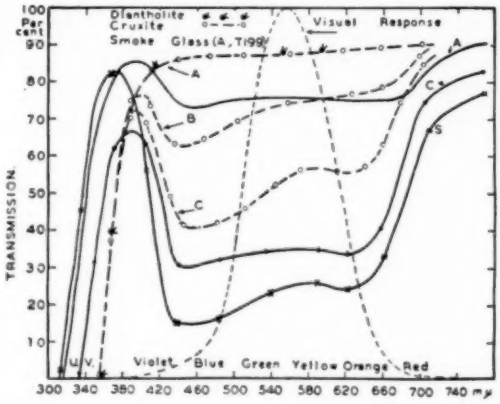

Fig. 3 (Coblentz). The transmission of "Diantholite," "Cruxite," and of smoke glasses, and the visual response curve of the eye.

the retina is usually affected before removal of the crystalline lens.

To make a beginning in the search for cases of atrophy of the color sense of the retina as a result of the prolonged wearing of colored lenses, the writer recently found two men, one of whom has been wearing shade *A*, amber lenses continually for over ten years, and the other has been wearing shade *A*, Noviol (yellow) lenses for the same length of time.

The history of the first patient is that he always suffered eye pain and discomfort prior to 1917 when he began wearing the amber glass. This gave him relief. In that sense he has formed the "habit", but the word does not have the sinister meaning that one infers from the advertisements. When tested with the Stilling and with the Ishihara color charts he fatigued easily and the physiologist who made the test for me concluded that this subject probably always had a weak color sense.

The history of the second person

(aged 45 years) is that he could not play tennis against the sun, so he decided to have a pair of Noviol *A* glasses made to order (corrected for myopia and astigmatism). His color sense, as tested with the Stilling and with the Ishihara color charts, is normal.

From these two cases (certainly one case) it does not appear that the question of the atrophy of the retina, as the result of its deprivation of violet and ultraviolet light, is so serious as the advertisements would have it appear.

From the foregoing it appears that the "resistance theory" of keeping the eye healthy by having all the rays present needs verification. In this connection it is to be noted that physiological and at least some photochemical reactions are not confined to single narrow bands of wavelengths. In none of the tinted lenses are the visible rays completely absorbed. Moreover there is usually no need of wearing tinted lenses all day.

If it is true that the eye becomes insensitive to visible rays because of their relatively low intensity or entire absence, which should occur in the use (1) of Soft-Lite, amethyst and amber lenses which partly absorb the blue-violet, (2) of Crookes' lenses which partly absorb the yellow and (3) of Azurlite and cobalt-blue glasses which absorb the red, then the proof should be readily established.

In this connection it is to be noted that the eye is not insensitive to the wavelengths corresponding to the dark Frauenhofer lines (for example the strong H and K lines in the violet, and the strong sodium D lines in the yellow) in the solar spectrum, which one would expect to find on the basis of the "resistance" or "atrophy" theory.

Another source of information would be an examination of workers who spend long hours under highly colored lights, for example, workers under red lights, or workers who prepare photographic materials, where the source of illumination is a narrow band of greenish light, to which the photographic plate is fairly insensitive.

Instead of promulgating alarming and unproved claims it would seem that it would be more profitable for the advertiser frankly and openly to stress personal appearance, utility, style, and the like, for, after all, personal adornment and appearance enter largely into the wearing of light-tinted glasses.

How many shade numbers are needed? The multiplicity of new tinted lenses, at least new trade names, is producing an intolerable condition that is economically bad. The crying need among opticians and other dealers in tinted lenses is a reduction in the total number of shades of tinted lenses, thus reducing the expense of carrying them in stock, as well as simplifying the whole problem of prescribing lenses.

When we consider that there are more than a score of different tinted lenses, if we limit the number of shades to three, the retailer would have to carry a minimum of sixty pairs of lenses. If he attempts to carry a small stock of each it would amount to from 300 to 600 pairs of lenses. Probably the most objectionable feature is the sudden change in style of lenses used, which leaves the dealer with a stock of unsold lenses.

There appears to be no need for this great variety of tints to be foisted on the public simply because some manufacturer or dealer applies a catchy trade name to a piece of colored glass and propounds a theory as to why his glass is superior to others.

It seems that the specification of tint and shade number should be determined by the ophthalmologists, if they really have any information upon which to base a demand for a specific color of glass. But the situation seems to be just reversed. At least the writer has met a number of ophthalmologists who could give but little more information than that contained in advertising claims as their reasons for suggesting the wearing of certain tinted lenses.

An examination of figure 2 shows that aside from differences in transparency in the ultraviolet there is but little difference in the transparency of the lightest shades of tinted lenses, in the visible spectrum. If we except the green and deep blue glasses the claims of opacity in the infrared are overrated—

common window glass being as good a protection as many of the others.

As already mentioned, the lighest shade O, in figure 1, having a transmission of eighty-five to ninety percent, offers no protection from real glare, and should have no place in the market other than for personal adornment.

When it is realized that a piece of ordinary clear glass transmits eighty-nine to ninety-one percent (the rest is lost by reflection) and that two such pieces placed together transmit only (90 × 90 =) eighty-one percent, the argument for marketing a so-called tinted glass (which transmits eighty to eighty-eight percent), particularly if marketed at a price much higher than ordinary white crown glass, should be substantiated by better reasons than now proclaimed.

Specification of the transmission of different shades. As shown in figure 1 there is a very wide spread in the transmissions of different shades of various makes of tinted lenses. In shade *A* the transmissions range from sixty percent to ninety percent, or a total range of thirty percent. In shade *B* the range is thirty-eight percent to eighty-eight percent, or a difference of fifty percent. In shade *C* the range is from twenty-five percent to seventy-eight percent, or a total range of fifty-three percent.

In order that the physician may know what he is prescribing it is imperative that manufacturers agree upon a set of transmissions and adhere to them as standards.

The writer suggests that the number of shades be reduced to three, (*A*, *B*, *C*) having transmissions that are easily remembered by the physician. The standard transmissions, thirty, forty-five and sixty (shades *C*, *B*, *A*) are easily remembered and they cover the average requirements. They are obtained from an extension of the federal specifications to lighter shades than those prescribed for eye protective glasses for use by industrial workers.[2] The suggested transmissions, densities, and tolerances are given in Table 1. Since all the material of any melt is used in some one of these shades, it is irrelevant whether the steps are uniform in transmission, or density.

Table 1

Specification of the percentile transmission and corresponding densities [D= log (1÷transmission)] of standard shades of tinted lenses. Shade no. 3 is taken from the federal specifications for goggles (GGG-G-541 of October 14, 1930).

Shade of lens	Transmission of visible radiation ("light") in percent			Optical density		
	maximum tolerance	standard value	minimum tolerance	minimum tolerance	standard value	maximum tolerance
A	65.0	60.0	52.6	.187	.222	.279
B	52.5	45.0	37.6	.280	.347	.435
C	37.5	30.0	22.5	.426	.523	.648
Federal spec. #3	22.9	13.9	8.6	.640	.857	1.060

If a darker shade is needed, the physician can prescribe a shade 3, of the industrial glasses, in the federal specifications, which glasses provide a thorough protection from ultraviolet and infrared rays. Since these glasses (shades *A*, *B*, *C*) are intended for wear out of doors, a special specification for protection from ultraviolet and infrared rays, as prescribed in the Federal code, does not seem vital. If the question arises, then the physician should prescribe industrial eye-protective glasses.

It is relevant to add that for driving

in bright sunlight the writer, among others, finds that shade 3 (shade *D* in fig. 1; transmission 15 percent) is none too dark.

For night driving it is impracticable to wear a shade *B* or *C* glass for protection from "glare". These do not afford sufficient protection from the oncoming automobile headlights, and, after the lights are past, the clearest glass, or none at all, is desired to drive on dark country roads on a cloudy night. What is needed is a double-decked glass, with the upper half very dark and the lower half colorless, or a suitable dark glass on the windshield.

Part II. The spectral transmissions of tinted lenses

Owing to the ever-increasing number of tinted lenses, having at least new trade names, if not differing markedly from their predecessors in chemical composition*, it is necessary to classify them, by grouping them according to some arbitrary system. This is relatively simple if we recall that the (physiological) visual sensation called "pink" results from the absorption of a narrow band of wavelengths in the blue-green of daylight; "blue" is the visual sensation resulting from the absorption of the green, yellow, orange, and red rays, and so forth.

As shown in figure 2, which gives the spectral transmissions of various glasses and also the visual response curve of the eye, tinted lenses containing only a small amount of coloring matter, are practically colorless, except when viewed edgewise.

The various tints result from the kind and the amount of coloring matter in the glass. The present classification of tinted lenses is, therefore, based upon the dominant color exhibited in some part of the visible spectrum. This color may of course be caused by an extension of a wide band of absorption (a) from the ultraviolet, (b) from the infrared, or (c) from both the ultraviolet and the infrared, into the visible spectrum. Lenses having marked selective absorption in a narrow band of the visible spectrum are principally Crookes (didymium) glasses, which, in the darkest shades, absorb heavily in the region of maximum visibility (at about 550 mμ, millimicrons), the resultant physiological effect being approximately a neutral tint.

The data presented herewith consist of some of the measurements made by Gibson and McNicholas[3] on glasses marketed several years ago ("T.119" in the illustrations); also data obtained by the writer, with the assistance of J. M. Hogue, on recent productions of tinted lenses. Additional data on infrared transmission and other details may be found in earlier papers[4, 5].

To utilize the illustrations to best advantage, the spectral transmissions are not given in the order of the classification.

The thickness of the samples examined was close to the standard; namely, 2 mm.

Most of the material examined was supplied by the following firms: American Optical Company, Azurine Lens Co., Bausch and Lomb Optical Company, Arthur Frank & Company, and the Willson Products Inc.

1. Colorless glasses

The most representative of this type of glass are White Crown (fig. 2), clear window glass (figs. 2 and 8), Cruxite and Diantholite (figs. 2 and 3), Viopake (figs. 2 and 4), and Cerium Oxide glass (fig. 2). The last-named sample was prepared by A. N. Finn at the Bureau of Standards.

As already stated all the light shades of tinted lenses are practically colorless except when viewed edgewise. Their transmission throughout the visible spectrum (see fig. 2) ranges from eighty-three to ninety-one percent. Their total transmission of visible radiation (fig. 1) is above eighty percent, and they offer little or no protection against glare.

* For example, one of the most recent offerings that has come to my attention is "Pink Diantholite". The Optometric Weekly, p. 155, March 24, 1932. This lens is practically colorless, except when viewed edgewise. The transmission in the ultraviolet and in the visible spectrum coincides with that of Cruxite, see figures 2 and 3.

2. Neutral-tint glasses

The most representative samples of this type of lens are the smoke (fig. 3) and the Crookes' glasses (fig. 4).

The smoke glasses (fig. 3) are characterized by a wide, fairly uniform absorption throughout the visible spectrum. Owing to the low spectral sensibility of the eye in the deep blue-violet, requiring a high intensity to evoke vision, the high transparency at 380 m μ has but little effect upon color values. In the deeper shades, as a result of the increased transparency in the red, objects like the sun have a reddish tinge. As a whole the smoke glasses are of neutral tint.

As already stated, the visual sensation evoked by absorbing the yellow

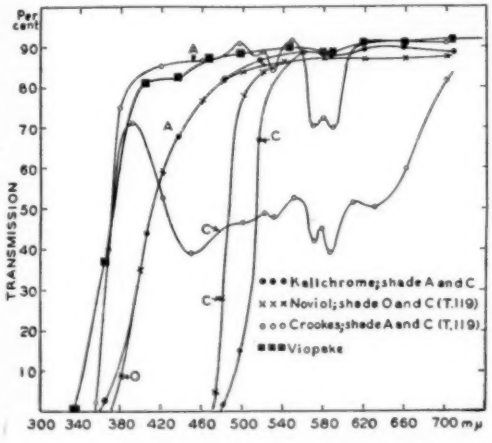

Fig. 4 (Coblentz). The transmission of colorless, neutral-tinted, amber, and of yellow glasses.

rays in Crookes glasses (fig. 4) is a fair representation of "neutral tint". Furthermore as already mentioned, if there is atrophy of the retina, as a result of practically the entire absence of a narrow band of wavelengths, then it would seem that the eye should be insensitive to the violet (H and K) Frauenhofer lines and the reversed sodium (D) lines in the yellow rays of sunlight.

3. Amber and yellow glasses

Typical examples of amber colored glasses are Amber (fig. 5), and of a more brilliant yellow are Noviol (figs. 4 and 10) and Kalichrome (fig. 4). Acutone (fig. 2) is made in but one shade that shows only a faint uranium yellow.

In this type of glass the absorption is high in the ultraviolet, and, in the darker shades, the blue and violet rays

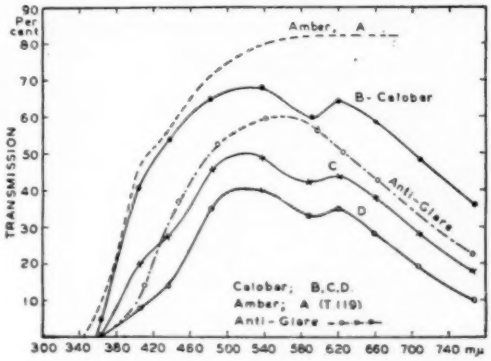

Fig. 5 (Coblentz). The transmission of sage-green, amber, and of blue-green glasses.

are absorbed. In the infrared the transmission is high and similar to that of clear window glass[6], which contains a small amount of iron oxide as an impurity.

4. Yellow-green glasses

Typical examples are Euphos, Fieuzal, Chlorophile, Hallauer and Akopos (fig. 6). The glasses in this group differ from the yellow and the amber glasses

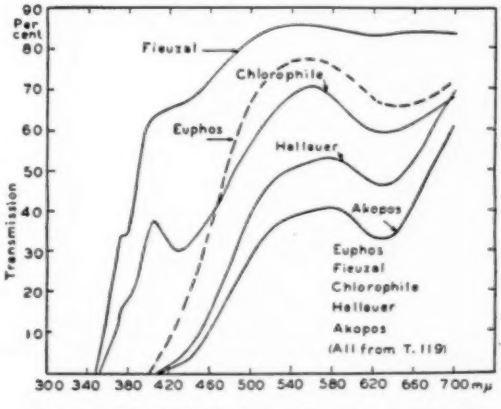

Fig. 6 (Coblentz). Showing the transmission of yellow-green glasses.

described under the preceding caption in that, superposed upon the ultraviolet absorption, which is common to both types, there are bands of selective ab-

sorption in the visible spectrum, producing a smoky greenish yellow in Fieuzal, and a chlorophyll green, "sea green", or yellowish-green tint in the

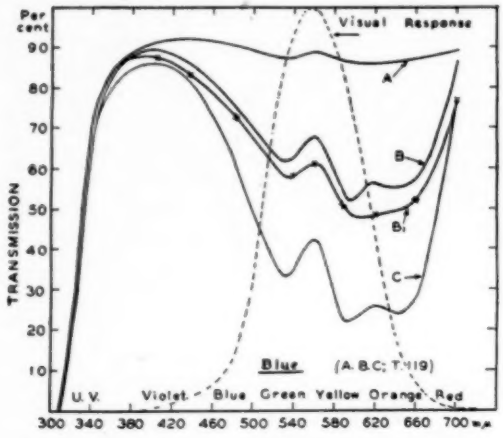

Fig. 7 (Coblentz). Showing the transmission of blue glass, and the visual response curve of the eye.

various glasses sold under the trade names Chlorophile, Euphos, Hallauer and Akopos (transmissions in fig. 6). The last three glasses appear to be different shades of the same kind of material.

The infrared transmissions of these glasses is high and similar to that of

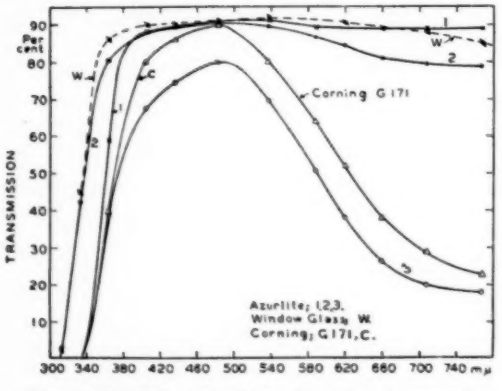

Fig. 8 (Coblentz). Showing the transmission of pale blue-green glasses.

white crown glass containing iron impurities.[6]

5. Sage-green, blue-green glasses

Typical examples are Calobar (fig. 5), Antiglare (fig. 5), Willsonite (fig. 9), and Noviweld (fig. 11).

The Antiglare and Willsonite glasses, especially in the darkest shades, have a smoky bluish-green tinge. The Noviweld glasses have a trifle more yellowish-green tinge. All are characterized by practically complete opacity to the ultraviolet[3] and the infrared[5]. Hence they are practically the only type of glass that can comply with the federal specifications for eye-protective glasses.[2]

Since glasses of this type are not worn continually it would seem that atrophy of the retina need not be considered.

6. Blue glasses

Typical examples of this type of glass are the deep cobalt-blue glasses (fig. 7)

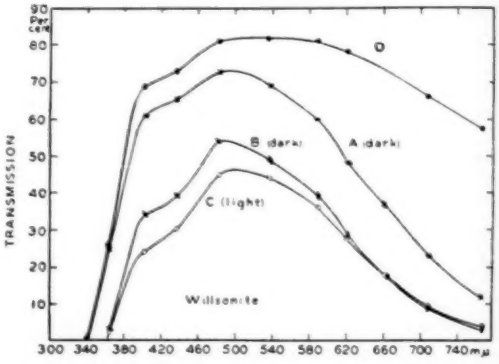

Fig. 9 (Coblentz). The transmission of bluish-green glass in various shades.

and the pale blue-green, Azurlite glass (fig. 8). The latter is similar to the pale blue-green glass, Corning, G. 171 (fig. 8)[4, 5].

The cobalt-blue glasses absorb selectively in the green, yellow and orange-red. The pale blue-green glasses, which are prepared from copper salts, have an absorption band in the infrared that extends into the visible spectrum.

The cobalt-blue glasses have a characteristic absorption band at 1500 mμ in the infrared. The light blue-green glasses have a characteristic maximum of absorption of about 900 mμ followed by high transparency at 2000 mμ[4, 5]. Hence neither glass would be used for completely absorbing the infrared.

As shown in figure 8 the lightest shade (no. 1) of Azurlite is colorless,

and in the deep red absorbs less than a sample of window glass having the same thickness.

7. Amethyst glasses

Typical examples of this type of glass are Amethyst (fig. 10) and Soft-Lite (fig. 11). Judging from their descriptive names, "Rose-lite" and "Old Rose" (mentioned in the first part of this paper) belong to this classification.

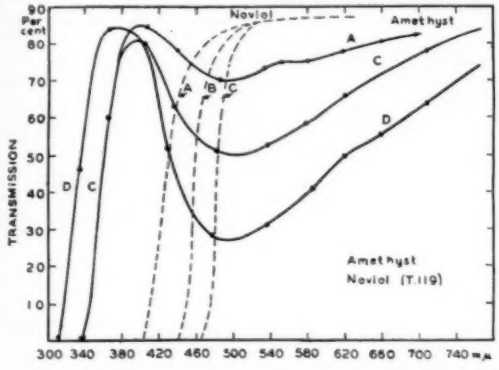

Fig. 10 (Coblentz). The transmission of amethyst glass.

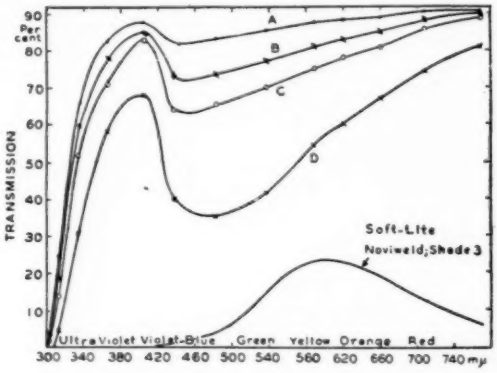

Fig. 11 (Coblentz). The transmission of an amethyst and of a yellowish-green glass.

Aside from the fact that Soft-Lite has a slightly more reddish tint than Amethyst glass, the spectral transmission curves of these two glasses, for the same shades, are practically the same.

Both glasses are characterized by a deep absorption band in the blue-green which almost disappears in the lightest, shade *A*, lense. The transmission in the ultraviolet and in the infrared[5, 6] is high, and not markedly different from white crown glass.

In conclusion, reference is made to a previous discussion of glasses for protecting the eye from glare[7], in which paper it was shown that only the darkest shades of tinted lenses can shield the eye from the intense glare of visible radiation, and that protection of the eye from ultraviolet solar radiation reflected from average surroundings is of secondary importance. On the other hand in the presence of artificial sources of ultraviolet light, used for healing purposes, dark glasses, which are opaque to the ultraviolet, should be worn to avoid injury.*

2737 Macomb street, N.W.

* Since the completion of this paper the writer has had a statement from a lens manufacturer that his reason for exploiting a colorless glass is that while he knows that the consumer desires colored lenses, the average optometrist and eye physician is not particularly interested in placing a colored lens before the patient's eyes. If this is the situation it seems an opportune time for this Association for Research in Ophthalmology to do some missionary work among optometrists.

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[6] Coblentz, Emerson and Long. Bur. Stds. Sci. Papers, No. 325, 1918, v. 14, p. 635.
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Discussion: DR. W. B. LANCASTER: A good many think that they get comfort out of wearing a Crookes A lens which is a lens with a very slight tint. What can be the foundation of that?

DR. COBLENTZ: The maximum visibil-

ity is in the yellow. The color sense is easily stimulated by yellow. The Crookes glass, that is, the original Crookes as distinguished from the Cruxite, got its trade name by adding didymium to the product and has an absorption band in the yellow. The dip in the absorption band in the yellow leaves a physiologically neutral color from which have been removed most of the stimulative rays, so to speak.

DR. LANCASTER: What percent would Crookes A cut out from sunlight?

DR. COBLENTZ: I think the transmission runs about eighty-five percent for shade A. Shades C and D eliminate more light.

DR. CARSON: To what extent does thickness of lens need to be considered in estimating the transmission factor?

DR. COBLENTZ: The manufacturers will know about how much coloring matter to put in the pot. In meeting the specifications for shades 8, 10, and 12 they would use more iron than if they desired shades 2 or 3 for glass of the same thickness. The average thickness of ordinary optical glass is two millimeters, but for high corrections, manufacturers are permitted some leeway. In glass two and one-half to three millimeters in thickness the various shades 6, 7, 8, and 9 may be obtained by merely changing the thickness; the lightest shade having a thickness of about 2 millimeters and the darkest shade a thickness of 2.8 to 3.0 millimeters.

CONTUSION OF THE EYEBALL WITH DELAYED INTRAOCULAR HEMORRHAGE

Report of three cases

FREDERICK C. CORDES, M.D., AND WARREN D. HORNER, M.D.
SAN FRANCISCO

Three cases in which a second intraocular hemorrhage followed a few days after a first, caused by trauma, are reported. From the Department of Ophthalmology, University of California Medical School.

The complications of contusion of the eyeball not sufficiently powerful to rupture the sclera are well known.

Rupture of the iris is not rare, either in the form of iridodialysis or radiating tears. Such tears may be either nicks in the pupillary margin or fissures in the iris substance. These ruptures are accompanied by hyphemia which, as Jackson[1] has pointed out, may conceal the iris injury. Contusions also may cause paralysis of the iris sphincter or a traumatic cycloplegia.

Injuries to the lens include rupture of the capsule with the formation of a traumatic cataract, and dislocations. Such dislocation may be forward into the anterior chamber, but more frequently it is backward. The commonest lens injury is a partial luxation caused by the tearing of a portion of the zonula fibers.

Vitreous hemorrhages also may occur, which, by their presence, cause complete loss of vision until absorption takes place.

Contusions can produce damage to the retina and choroid. The retinal injury takes the form of a commotio retinæ in which the edema temporarily impairs vision. Injuries of the choroid are far more serious inasmuch as they usually appear as crescentic tears which may involve the macula.

Contusions of the eyeball with hyphemia which present none of the foregoing complications, usually are regarded as simple injuries that will clear within three or four days.

We are reporting in this paper three cases in each of which the patient, though apparently he suffered only a simple contusion of the eye, developed unusual complications.

Case 1: J. G. aged 18 years, when seen Oct. 7, 1930, gave the history of

having been struck in the right eye the previous day by a tomato. His vision was hazy and he had observed some blood in the eye. There was no pain or particular discomfort.

Examination: R. E. V. = 0.3; with correction, 0.6; L. E. V. = 0.8; with correction, 1.0. The right eye showed mild ciliary injection; the conjunctiva and cornea were negative. There was a hyphemia in the lower fifth of the anterior chamber. No tears were apparent in the iris, nor was there iridodonesis; the pupil, which was mid-dilated, reacted slowly to light. The aqueous was slightly cloudy; the lens was negative. The fundus was grossly negative. The tension was normal.

In the left eye, both external and fundus examinations were negative.

Treatment consisting of heat, atropine and dionin was instituted and the patient was told to remain quiet and to avoid physical exertion. Four days after the injury, the hyphemia had been absorbed and the vision was normal. Careful fundus examination failed to reveal any pathologic change. The patient was told that he might return to college in two days but, at the same time, was cautioned further against violent exercise.

On October 11, five days after the injury, he kicked a football for approximately half an hour. That evening, severe pain developed in the right eye. Examination showed the anterior chamber to be entirely filled with fresh hemorrhage. The tension was increased. Ice compresses were used for the first twelve hours, after which heat, atropine and dionin were employed. As atropine definitely increased the tension, eserine was substituted. Absorption of blood failed to take place and an acute secondary glaucoma developed, which necessitated surgical interference on October 22nd. Through a keratome incision, a mass, consisting of old blood and fibrin, was removed and the anterior chamber was irrigated. Healing took place without complications and the tension remained normal. In spite of a clear anterior chamber and lens, no red reflex was obtainable, indicating an extensive vitreous hemorrhage. With time, this vitreous hemorrhage slowly absorbed until, eleven months after the injury, the vision was 0.4, with correction. Because of the hazy vitreous, a detailed examination of the fundus was not possible, but it appeared to be normal. The field was normal.

This patient showed an esophoria of seven to ten degrees in examinations made prior to the injury. With the temporary loss of vision of the right eye, a frank internal strabismus developed, necessitating corrective surgery.

Case 2: W. O'N. aged 17 years, was seen on July 1, 1931. He gave the history of having been struck in the left eye by a tennis ball the preceding day. His vision was blurred and the eye was slightly painful.

Examination showed R. E. V. = 1.0; L. E. V. = 0.3, blurred; unimproved by lenses.

Right eye: Both external and fundus examinations were negative. Left eye: There was ciliary injection; the cornea, conjunctiva, and sclera were negative. The lower third of the anterior chamber was filled with blood. The pupil was irregular and reacted slowly to light. The tension was normal; the fundus, seen with difficulty, was grossly negative.

Hot compresses, atropine and rest, were ordered. The following day, much of the hemorrhage had absorbed. The third day after the accident, the patient returned with a fresh hemorrhage filling the lower half of the anterior chamber. He had taken a brisk walk the night before in spite of warnings to keep quiet.

The patient was sent to the hospital for further treatment. During the ensuing two days, there were several small additional hemorrhages. After some absorption had taken place, it was quite apparent that an extensive vitreous hemorrhage had occurred. Five days after admission to the hospital, a very active exudative iritis developed, for which intravenous typhoid therapy was used, with beneficial results.

After leaving the hospital, the vitreous hemorrhage gradually absorbed. On September 3, 1931, two months after the accident, the left eye showed vision of 1.0 partly. With the slitlamp, the iris showed some depig-

mentation below the pupillary area. Faint vitreous opacities were still present. The fundus was negative.

Case 3: J. K., aged 35 years, reported April 15, 1931, after having been struck in the left eye that day by the end of a whip-lash, which caused blindness and cuts in the upper and lower lids.

Examination: Right eye; both external and fundus examinations were negative. Left eye: the vision was limited to large objects. The cornea, conjunctiva and sclera were negative but there was mild ciliary injection. There was a hyphemia filling the lower half of the anterior chamber; the pupil was not dilated; the intraocular tension was normal. Examination of the fundus was not possible.

Cold compresses and atropine were ordered, and the patient was told to remain quiet. The following day, about one-third of the hemorrhage had absorbed. Because of the distance at which the patient lived, he was told to report again in two days. Upon his return, the eye was painful and the entire anterior chamber was filled with fresh blood, none of the iris being visible. Tension was 35 (Schiøtz). Although there was no history of severe physical exertion, the patient had not remained quiet as advised. Three days later, there had been no relief from pain and no appreciable absorption of the hemorrhage. Because of the glaucoma and the resulting pain, an attempt was made to remove the blood clot from the anterior chamber. The keratome incision was remarkable, in that neither aqueous nor fluid blood escaped. Only a portion of the rubbery clot could be removed by spoon, forceps, or lavage. A few days following operation, the tension was slightly lower but still remained above normal. At no time did the blood absorb sufficiently to permit the iris to be seen. Yellowish exudate gradually developed about the wound and made its way deeper into the anterior chamber. A second attempt at lavage was also unsuccessful. The intraocular tension remained high and pain was severe. On April 28, the contents of the anterior chamber were more gray than dark red, and light perception became faulty, indicating that the eye was lost. Upon being told of this unfortunate situation, the family insisted that the patient be transferred elsewhere and he was not seen again. Enucleation undoubtedly was performed later, since rupture of the globe was imminent.

Comment

For the first few days, the three cases here reported, appeared to be instances of simple contusion with hyphemia. However, within from three to five days after the injury, marked recurrent hemorrhages occurred even though absorption of the primary hyphemia was taking place and had disappeared entirely in the first case. In reviewing the literature, we found no reference to delayed vitreous hemorrhage after contusions. Jackson[1], however, does say that iris hemorrhages may recur.

Hyphemia following contusions may be derived from various sources.

Contusions resulting from small, rounded objects striking the corneoscleral margin may cause a rupture of the canal of Schlemm, with bleeding into the anterior chamber. Czermak[2] says that the bleeding occurs rather rapidly and is followed by a diffuse dullness of the cornea, together with corneal lines that probably are caused by folds in Descemet's membrane. The pupil is dilated temporarily but returns to normal in a few days. The diagnosis is based upon corneal changes, absence of iris injury, hyphemia, and a mydriasis of short duration.

Various injuries to the iris such as iridodialysis, rupture of the sphincter, irideremia, and radial or circular tears, all produce hyphemia that, as a rule, absorbs in a short time. In the lesser injuries, blood comes from the ruptured vessels and spreads over the iris as a diffuse, reddish-brown mantle. In larger tears, hemorrhage may fill the anterior chamber.

With a partial tearing of the fibers of the suspensory ligament of the lens, the ciliary processes also may be injured sufficiently to cause bleeding and produce a hyphemia. Fuchs[3], says that this tearing of the zonula occurs fairly frequently, especially in young subjects.

Vitreous hemorrhages may follow contusions. Würdemann[4] says that the bleeding results from ruptured blood vessels of the ciliary body or choroid. In a small percentage of cases, the origin may be from a damaged retinal vessel. In the majority of instances, the hemorrhage "leads down" from the ciliary body behind the posterior capsule of the lens.

The source of the secondary hemorrhages in our cases, is speculative. In all three patients, the primary bleeding probably came from the iris. A secondary hemorrhage occurred in the vitreous in cases one and two, and probably also in case three. Assuming that the contusion ruptured some of the zonular fibers and caused damage to the ciliary vessels, this could have come from the ciliary body. Increased blood pressure following the physical exercise mentioned might have opened a previously damaged blood vessel.

The routine treatment recommended for these contusions is, rest under a mydriatic. Würdemann[4] however, says that radial tears of the iris are best drawn together be eserine. He says also that in contusions with hyphemia, iritis seldom occurs unless the globe has been penetrated. Recently, Hardesty, Green, and Luedde[5] in discussing contusions of the eyeball, warned against the indiscriminate use of atropine. They reported cases in which glaucoma immediately followed the use of this drug. Thus it would appear to be safer to use atropine only where iritis develops.

In the early stages, the use of ice compresses, calcium chloride, and ergot, is recommended. In the later stages of vitreous hemorrhage, following contusion, heat, dionin, and subconjunctival injections of salt solution or Ringer's solution are indicated.

Physical rest is a most important factor in these cases. Where possible, complete rest in bed for three to five days is justifiable, since ambulatory patients are so prone to disregard warnings against exertion. The patient who kicked the football (case one) is a fair example.

It is apparent that contusions of the eye, complicated only by hyphemia, must be regarded as potentially serious cases. In the treatment of this condition, avoidance of physical exertion and the indiscriminate use of atropine are emphasized.

384 Post street.

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THE FITTING OF CONTACT GLASSES

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An exact description of a method for fitting a contact glass to the eye is given. Read before Chicago Ophthalmological Society, March 21, 1932.

Contact glasses, worn under the eyelid and invisible, are now a fully accepted practical means of greatly improving the visual acuity of keratoconus. They may also be worn in cases of ametropia as a substitute for spectacles.

Information as to the methods of fitting contact glasses has not heretofore been freely available. The subject has been glossed over as if it were a simple matter needing no elucidation. Sets of Zeiss test lenses have been made available for the use of ophthalmologists by certain optical houses, but directions for their use were not included.

Fig. 1 (von der Heydt). Invisible contact glass.

The original set for fitting keratoconus consisted of glasses with four different corneal curves. There are now sets of twenty-two to thirty-nine or more different test glasses available for fitting purposes. It is questionable whether this large number is really essential for efficient work, especially when restricted to correction of keratoconus cases.

Fitting keratoconus: Patients presenting moderate degrees of keratoconus that can be given useful vision with spectacle lenses do not need contact glasses.

The external corneal surface of a normal eyeball has a curvature with a radius of about 8 mm. The corneal diameter of the eye approximates 11 mm., hence a base of 12 mm. is ample for the corneal portion of the glass. The scleral area covered by the rim or collar of the contact glass is 4 mm. in width. The total base of the contact glass is therefore 20 mm. in diameter. The curve of the scleral rim, with a radius of 12 mm., usually rests quite flat on the conjunctiva of an eye of *average* size. In order to accommodate larger and smaller eyeballs, rims with radii of 13 and 11 mm. are made. These variations have proven too extreme. At present I am using rims having radii of 12.5 and 11.5 mm. (apart from the 12 mm. standard). I have already found an 11.5 mm. radius to be extreme, but it may be of possible use in a small hyperopic eyeball. In cases of large eyeballs, where the external contact glass edges may disturb the conjunctival circulation, a 12.5 mm. radius may be tried. I have one patient whose high myopia, and therefore large eyeball, necessitated a 12.5 mm. radius for comfort.

Because a perfect scleral fit is of paramount importance, it is contended that test lenses with a great variety of scleral curves should be available. Test sets may be had with lenses from 11 to 13 mm. scleral radius in steps of 0.2 mm. I do not believe in extreme variants from the standard of 12 mm. According to Salzmann, there is not much variation in the extra corneal shape of large and small eyeballs.

I have made gauges for the purpose of measuring the height of the corneal segments of both eye and contact glasses. One was a simple silver rim of 13 mm. diameter to rest on the scleral border, supporting a plunger, on the or-

der of a tonometer, and another was made with a lever and scale. This can be used on the anesthetized eyeball as well as on the contact glass for the purpose of measuring the height. The ends of the instrument (one end not shown in the illustration) present curves for measuring scleral radii. Dr. Helmbold has devised a more complex model with a series of flat plungers which can be locked, thus outlining the curvature. While these instruments are an aid in this work, they are not essential.

The radii of the corneal part of contact glasses need not be greater than 8 mm., as this is the curvature of the normal cornea. Flatter lenses are found in trial sets, but I have not found use for them. Corneal radii of 8.0, 7.5, 7.0, and 6.5 mm. are standard for keratoconus cases.

According to ideals expressed by many European ophthalmologists, pressure on the apex of the cone is not harmful and may inhibit progression of the disease. I cannot agree that the latter has been proven, as keratoconus is a self-limited disease and ceases to progress at about thirty-five to forty years of age. A large number of slight and moderate degrees of keratoconus which have been stationary for years, are incidentally discovered by slitlamp investigation in elderly people. I have found several individuals beyond middle age with mild degrees of keratoconus, showing keratoconus stripes which had only progressed to the loss of visual acuity of one line.

In order to ascertain if the contact glass touches the apex of the cone, one may interpose a fluid layer of fluorescein solution. If the cone touches, the area of contact will be unstained, surrounded by a green ring. A more accurate method of ascertaining the thickness of the fluorescein layer is by inspection with the narrow beam of the slitlamp. I do not think a slight contact is harmful, but prefer a minimal layer of fluid. If the area of central contact is too large, a (higher) test glass with a smaller corneal radius must be tried. A large contact area will cause a visible wrinkling of Descemet's membrane by lid pressure and must be avoided. Air bubbles under the glass must also be avoided. Some years ago I devised a simple rubber nipple for the purpose of holding the contact glass for insertion. The firm of Carl Zeiss has improved on this by the addition of a smaller vacuum cup within the nipple bulb. The wet nipple is slightly compressed and attached to the contact glass. Too much vacuum suction must be avoided or

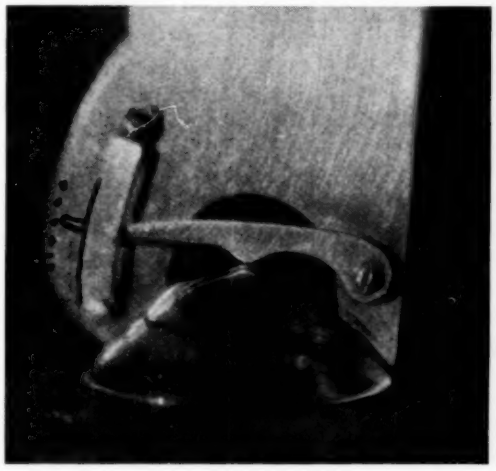

Fig. 2 (von der Heydt). Contact glass gauge (x 1.8).

pressure on the nipple will not release the contact glass. It is advisable to try a few times to ascertain the amount of suction necessary for safe holding and prompt release.

Let us presume we have chosen a 2/7.5 test glass (12 mm. scleral, 7.5 mm. corneal radius) for trial, using an anesthesia of holocaine two percent. The glass cavity is filled with a normal salt solution of body temperature. The patient (standing) bends his head forward until his eyes are directed to his toes. With his arm over his head and using his most convenient finger he lifts the upper lid away from his eyeball. The physician holds the nipple and contact glass filled with the warm solution and manages the lower lid. He first directs the edge of the contact glass under the upper lid margin (similar to the insertion of an artificial eye) and tells the

patient to let the lid go, then draws the lower lid edge farther down over the edge of the contact glass and releases the latter by squeezing the nipple. If the patient has cooperated and continued to look at his toes, a bubble-free insertion will be accomplished. The excess fluid is all that will have been spilt. It is not advisable to do the fitting on an uncarpeted floor, for fear of breaking the glass should it fall. Most patients will soon learn to do the inserting alone, prying their eyelids apart with the fingers of one hand.

The next step is to find the weakest spherical addition necessary to bring the visual acuity to its maximum. Rapidly try various spherical trial case lenses held close to the eye. As a rule normal visual acuity, less the clouding of scar tissue if present, is obtained. The lens thus selected is then worn in a spectacle, or the contact glass may be so ground that this sphere is combined with the corneal segment. I am inclined to plano—or afocal contact glasses in keratoconus, because it is simpler to make changes in the spectacle lens. After having decided on the contact glass required, including examination of its fit with the slitlamp, a tolerance test is made after the effect of the anesthesia has worn off.

My most recent four patients learned the manipulation in one day, including self-insertion without anesthesia. If this is not possible, anesthesia must be resorted to until insertion is better mastered. The contact glass may be quite easily removed with the wet rubber nipple or a dull hook. The same contact glass will usually give equally good visual acuity in either eye. I advise the wearing of only one, but I have one patient who wears a contact glass in each eye.

Correcting ametropia: To correct ametropia so that spectacles need not be worn, an 8 mm. radius corneal curve may be considered basic with the addition of any sphere necessary to correct the ametropia. Ophthalmometric measuring of the corneal curvature may present a refinement in determining the corneal curvature, but it is not essential. The contact glass eliminates all corneal astigmatism. Spherical corrections are ground on the outer side of the corneal curve. A tolerance test with the proper afocal contact glass is advised before combinations are prescribed.

In fitting higher degrees of ametropia it is best to have a variety of test contact glasses available, including strong plus and minus corrections. The lens selected at spectacle distance calls for a change in power when ground onto the contact glass. To make the required compensation the vertex distance of this lens from the test contact glass should be stated.

I have a young woman patient with a myopia of 4 diopters, who wears a contact glass at social affairs. Contact glasses have proven very practical for swimmers, athletes, actors, and others who cannot or do not wish to wear spectacles.

There will be but little trouble fitting patients who are enthusiastic and willing to cooperate intelligently.

25 East Washington street.

OPTIC NEURITIS AND OPTIC ATROPHY DUE TO THALLIUM POISONING FOLLOWING THE PROLONGED USE OF KOREMLU CREAM

Report of a case

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COLORADO SPRINGS

One case is described and the literature reviewed. Read before the Colorado Ophthalmological Society, October 16, 1931, and Colorado Congress of Ophthalmology and Otolaryngology, July 23, 1932.

Thallium poisoning has been the subject of several recent papers; especially since the attention of the medical profession has been attracted to it by a report of the Bureau of Investigation of the American Medical Association.[1] This report pointed out the dangers of a proprietory depilatory cream, called Koremlu cream, which was found to be particularly high (seven percent) in thallium acetate content. In the cases reported the poisoning has been characterized by peripheral neuritis, endocrine disturbances, and alopecia; optic nerve involvement and other ocular complications have been very rarely seen. The following recent case of optic neuritis and optic atrophy due to thallium poisoning should, therefore, be of more than passing interest.

Miss Z. B. D., aged forty-seven years, first consulted her physician, Dr. John B. Crouch of this city, on February 10, 1931, complaining of a severe pain in the left side of the chest, external to the heart. Physical examination was negative except for septic tonsils, and devitalized teeth with apical abscesses. Removal of the infected teeth was followed by relief of chest pain. However, constant severe pain in both feet and legs, extending to the knees, soon developed. The feet were very tender to pressure; the patient could not endure the weight of bed-clothes. She walked with difficulty, the gait appearing to be due more to pain than to deformity. No history of the use of alcohol, lead or arsenic medication could be elicited.

Physical examination revealed a well-nourished patient, with considerable hair on the face, chest, abdomen, and legs. The feet were slightly reddened, but not swollen. Arm, abdominal, and plantar reflexes were normal. The patellar reflexes were equal, but slightly sluggish. Blood pressure was 146/80. The blood Wassermann and urine were negative; the blood picture was normal. Except for septic tonsils no pathology was found in the upper respiratory tract. The diagnosis was peripheral neuritis of infectious origin. The tonsils were removed on May 16, 1931, and from them a vaccine of streptococcus viridans was made. The condition gradually progressed, in spite of administration of vaccines, ovarian extract, and salicylates. Some numbness of the hands, and slight weakness of the right hand in writing soon developed, to be followed shortly by some stiffness in both knees and weakness of both feet. Pain was still severe. On May 19, 1931, the patient was allowed to leave the hospital, unimproved. Two weeks later, there was complete foot drop with inability to move the feet or ankles. On July 1, 1931, it was discovered that the patient had been using Koremlu depilatory cream for several months, even while in the hospital. This discovery and the case reports of Duncan and Crosby[2] and Greenbaum[3] and Schamberg[4] led to the correct diagnosis of peripheral neuritis due to thallium poisoning. Discontinuance of the depilatory cream was advised. Institution of measures to promote elimination, such as calcium, iodides, sodium thiosulphate, sweats, and so on, were followed by some improvement. A month later the pain had disappeared but the motor symptoms had increased. The patient was unable to move her feet, and walked with high-stepping gait, and only when aided. The foot and Achilles reflexes, once absent, were gradually returning.

On August 6, 1931, the patient was referred to me with the complaint of blurred near-vision and asthenopia. There was no history of diplopia or photopsia. She had obtained reading glasses from an optician six months before. External examination of the eyes

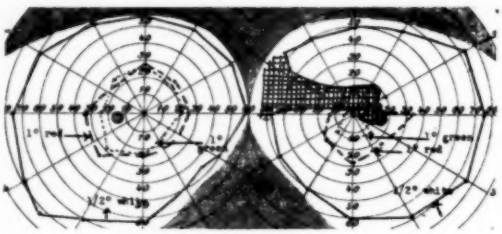

Fig. 1 (Stine). Visual fields on August 8, 1931.

was negative except for slight sluggishness of the pupillary light reflex in the right eye. Ocular movements were normal. Vision was O.D., 0.3; O.S., 0.6. With the old reading glasses, +1.50 D.sph. each eye, the near point was O.D., 27.5 cm. D. J. 4, O.S., 27.5 cm. D. J. 1 Muscle balance was essentially normal. Central color perception for red and green was good, the colors appearing brighter with the left eye. The Ishahara test plates indicated red-green blindness of each eye.

Ophthalmoscopic examination showed the following: Right eye: Media clear; definite pallor of the disc with some shrinkage of the nerve substance; excavation broad and shallow; lamina cribrosa clearly visible almost to the temporal margin; disc margins slightly irregular; arteries somewhat contracted, the inferior and superior temporal arteries being irregular in caliber near the disc. In the macula numerous minute glistening white dots were seen. No hemorrhages or exudates were visible. Left eye: Media clear; disc larger than the right, and had a dirty gray, succulent appearance, as if very slightly swollen; capillarity about normal; physiological excavation very small, and appeared filled in; lamina cribrosa not visible. The arteries were slightly contracted. Macula and periphery of fundus were normal.

Retinoscopy indicated —0.25 D.sph. in each eye.

Fields taken on the modified Ferree-Rand perimeter under illumination of seven foot candles, were essentially normal for one-half degree white and one degree red and one degree green in the left eye. In the right eye there was an absolute sector defect running from the blind spot through the upper central area to the nasal periphery between the 150th and 180th meridians. There was a superior altitudinal defect for one degree red and green. In the central field studies on the Lloyd stereo-campimeter, the absolute sector defect in the right visual field was found to encroach and involve fixation above. The field for one-half degree red was limited to a very small irregular area running downward from fixation for ten degrees. In the left eye the blind spot was enlarged for one-half degree white, with wing-shaped scotomata extending temporally and nasally, the nasal enlargement resembling an early Bjerrum scotoma. The scotoma was larger for one degree red. The central field for one-half degree red was contracted irregularly, more so in the temporal portion.

The diagnosis was optic neuritis and postneuritic optic atrophy due to thallium poisoning. A guarded prognosis was given, owing to the lack of reports of similar cases and their outcome. Continuation of eliminative measures and restriction of near use of the eyes were advised.

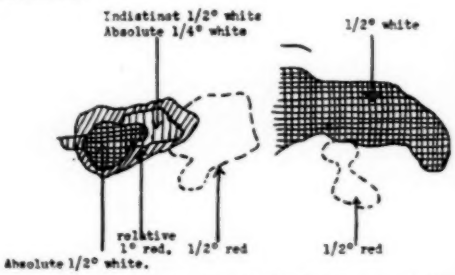

Fig. 2 (Stine). Central fields on Lloyd stereo-campimeter, August 8, 1931.

One month later, the patient reported considerable improvement in her condition. Vision had increased to O.D., 0.5+, and O.S., 0.9. Jaeger 2 could be read at 33 cm. with the right eye. Fundus examination showed little change, except that the left optic disc did not appear quite so swollen. Some

improvement in the visual fields, taken on the stereo-campimeter was noted, especially in the fields for one-half degree and one degree red.

On October 27, 1931, two and one-half months later, further improvement was noted. The patient was able to walk unaided in soft slippers. Vision was O.D., 0.6, and O.S., 0.9. (Near point with old glasses 27.5 cm. J. 1 each eye.)

Refraction was: R.E. —0.25 D.sph., V. = .9. Pp: with +2.00 sph. added, 28.5 cm. 1.1. Accommodation: 1.5, J. 1. L.E. —0.37 D.cyl. 165°, V. = 1.2 Pp: with +2.00 sph. added, 28.5 cm., J. 1. This was prescribed with +2.00 D.sph., added to each eye for near vision.

Fundus examination showed: Right eye: Media clear; disc, increased pallor, otherwise not changed. Left eye; Media clear, disc somewhat paler, capillarity poor; excavation still filled in; upper nasal portion of the disc slightly cloudy and swollen.

The patient was not seen again until January 7, 1932, five months after her first visit to me. She walked into my office unaided, but with moderately high-stepping gait. She reported that the annoying blur in distant vision had been relieved and she could read with comfort. Visual tests, however, showed no change in distant and near vision with her glasses. Ophthalmoscopic findings were practically unchanged since the previous visit. The right visual field

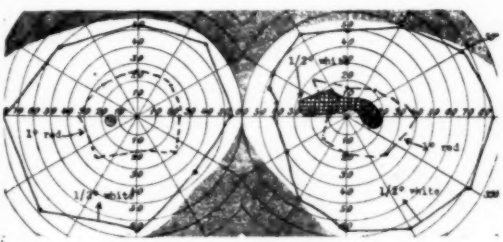

Fig. 3 (Stine). Visual fields on January 13, 1932.

showed some recovery of the nasal field, the sector defect being narrower and extending out only to 28°. The field for red had enlarged. On the stereo campimeter the left blind spot was somewhat further enlarged in the nasal portion, but the ceco-central scotoma had diminished in size and intensity.

In every way the patient had improved and was very pleased and relieved with the outcome to date. She had no subjective symptoms with respect to her eyes.

In all probability, thallium acetate was the etiological factor in this case. The case was reported to the Colorado

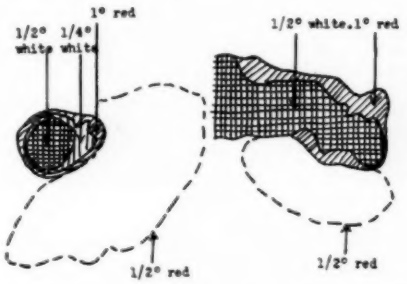

Fig. 4 (Stine). Central fields on Lloyd stereo-campimeter, January 16, 1932.

Ophthalmological Society on October 16, 1931, and the members concurred in this opinion. The many case reports in the recent literature, Lansbury[5], Short[6], Waring[7], Duncan and Crosby[2], Schamberg[4], Greenbaum[3] *et. al.*, testify to the toxicity of thallium, especially following the use of Koremlu, a depilatory cream. The exhibition of Sabouraud's[8] thallium acetate (one percent) ointment in the treatment of hypertrichosis has also produced toxic symptoms, and for this reason Sabouraud himself discontinued its use. No optic nerve involvement was found in the cases of the above authors, except perhaps in the case of Duncan and Crosby[2], in which some blurring of vision, but with normal ophthalmoscopic findings, was noted. Mahoney[9] published three cases of retrobulbar neuritis following the prolonged use of Koremlu cream. Alopecia and peripheral neuritis were also present. The three examples presented were of patients who entered a neurosurgical clinic as "intracranial tumor suspects". Their failing vision was checked and improved by discontinuing the use of the depilatory product.

An earlier report of the toxic effect of thallium on the optic nerve is that of Kaps[10], who noted retrobulbar neuritis, alopecia, peripheral neuritis, dementia, and death following the giving of

a rat poison containing thallium acetate (Zeliopaste), with homicidal intent.

Experimentally, Richet[11] in 1899 found that thallium, as well as lead, produced a non-inflammatory keratitis, characterized by progressive opacity of the cornea. Buschke[12] in 1922, reported that the feeding of thallium to animals produced a symptom complex which pointed to an influence on the endocrine system. Besides cataract formation, it caused alopecia, atrophy of the testicles and adrenal glands, nephritis, and a stunting of growth. With the exception of cataract, these symptoms disappeared upon withdrawal of the drug. Of the one hundred animals experimented on, eleven developed cataracts, which in two were unilateral. At postmortem, thallium was found in all the organs except the lens. In later experiments, in 1928, Buschke[13] and his associates were able to produce partial optic atrophy in animals with thallium.

Thallium was discovered by Crookes in 1861. Lamy[14] in 1863 investigated its chemistry and incidentally experienced symptoms of polyneuritis due to absorption of the metal. Thallium (atomic weight 204) belongs in the group with lead, zinc, and tin, but its action is similar to that of potassium and arsenic, rather than the heavy metals. It has a definite accumulative effect. Dixon[15] found that thallium in its effect on the autonomic nervous system resembles that of strychnia on the central nervous system, allowing impulses to pass more readily than normally.

Conclusions

1. A patient developed polyneuritis, optic neuritis, and optic atrophy following the prolonged use of Koremlu depilatory cream which contained seven percent thallium acetate.

2. Relief from sensory symptoms, and steady improvement in the motor paralysis and visual acuity followed withdrawal of the drug and institution of measures to promote elimination.

3. Ocular complications of thallium poisoning are rare, but clinical and experimental evidence show the distinctly toxic effect of thallium on the eye.

4. Cataract, keratitis, optic neuritis, retrobulbar neuritis, and postneuritic optic atrophy may be caused by thallium poisoning.

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RADIATIONAL CATARACT

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Reported cases of radiational cataract are discussed and the pathology of this entity described. Two new human cases are cited. From the Department of Ophthalmology, Northwestern University Medical School. Read before the Chicago Ophthalmological Society, February 15, 1932.

In the past ten years, clinical observation and animal experimentation have segregated a distinct type of cataract which de Schweinitz has very aptly termed radiational cataract[1]. Our advancing knowledge in this field has clarified the hazards attending the exposure to infrared rays, x-rays and radium. Not so long ago these very agents were advocated by some for the treatment of incipient cataract. In 1925, Pfahler[2] mentioned a case under his observation in which the x-rays had been so used. Cohen and Levin[3] in 1919, and Franklin and Cordes[4] in 1920 reported rather favorably on incipient cataracts treated by radium, but the studies of McKee and Swett[5] in 1924 indicated that the remedy was not only useless but harmful.

Instead of being relatively immune to the action of radiation, the lens is now recognized as the most susceptible of the ocular tissues. Over fifty human cases of x-ray cataract have been reported. The first observation was by Guttmann and Treutler in 1905 in a worker engaged in the making and testing of x-ray tubes. Since then cataracts have generally been an unexpected outcome of therapy, and only rarely have x-ray workers been affected. Most cases have occurred following treatment of skin lesions of the face (lupus vulgaris, lupus erythematosis, eczema, acne, sycosis, Mikulicz's disease), or of ocular conditions (vernal catarrh, lid cancer, scleral lymphoma, limbal carcinoma, glioma, intraocular sarcoma, orbital sarcoma), and, less often, after radiation of tumors of the skull and cranial cavity (nasopharyngeal fibroma, hypophyseal tumor). The first case due to therapeutic irradiation was reported by Birch-Hirschfeld in 1908. Reports have followed since by Paton (1909), Axenfeld (1915), Weill (1919), Wilkinson (1920), Salzer (1921), von Horay (1922), Dor (1923), Pfahler, Ziegler (1924), Ascher, Scheerer (1925), Rohrschneider, Erggelet, Stock (1928), Jess, Scardapane, Michail (1929), Antonibon, Geraldi, Grossman, Peter (1930), Moore, Nordmann (1931).

These cases involve all age periods, and have in common a history of heavy dosage, with probably insufficient protection to the eye, a remarkably long latent period (at earliest one to two years, sometimes eight or more years after radiation), a characteristic lens picture, and the absence of any apparent damage to the other ocular structures. In Paton's report[6], a woman of twenty-six years of age was treated for lupus of the cheek with about twenty exposures to each side. The eyes were protected by rubber sheeting only. Six years later vision was reduced to counting fingers. In the posterior part of each lens was a dense grayish plaque. Cataract extraction was performed on one eye with 20/20 vision resulting. Ascher's case was treated for scleral lymphoma with one skin erythema dose. Eight years later cataract developed. Nordmann's patient was a young boy treated for sycosis with a single depilatory dose. Some years later bilateral cataract developed. Fetuses, with cataracts, have been delivered following x-ray for therapeutic abortion. Peter[7] mentions a girl of seven years of age who received a total of four and one-half skin erythema doses. Five years later cataract developed. Wilkinson's[8] patient was a woman of forty years of age. In 1917, when she started treatment for lupus erythematosus, her vision was R.E. 20/20; L.E. 20/30. Two and a half years later she developed bilateral cataract. After operation her corrected vi-

sion was R.E. 20/15; L.E. 20/20. Moore[9] tells of a young man of twenty-six years of age who was treated for facial sycosis. In four months he received a total of 12 Sabouraud units. Two years later his vision was reduced to 20/40 in each eye, and still one year later to 20/200. After operation, the corrected vision was 20/20.

The cataract produced by x-ray has certain definite characteristics, and the description of all deported cases has been quite similar. On focal illumination there is found a plaque-like opacity in the posterior cortex of each lens, bordered by a zone of powdery opacity. The plaque is directly opposite the pupillary area, and has sharp borders both anteriorly and equatorially, differing thus both from cataracta complicata with its porous construction and diffuse peripheral encroachments, and from senile posterior cortical cataract, which tends to advance along an ill defined border equatorially. The plaque is especially thick in the central portion and thins out evenly towards its margin. It advances concentrically, keeping its sharp borders.

The slitlamp shows immediately under the anterior capsule, delicate gray striæ with the sheen of asbestos, among which are very fine subcapsular vacuoles and minute dot-like opacities. Both the capsule and the central portion of the lens are free from change. Immediately anterior to the posterior lens capsule is a dense reticular clouding, the meshes of which are filled with moderate sized vacuoles (fig. 1.) With the narrowed beam, one finds that the posterior polar opacity is of plano-convex form, and bordered anteriorly and posteriorly by a denser opaque layer. The posterior layer has a course corresponding to the posterior lens capsule, while the anterior layer is parallel to the iris diaphragm (fig. 2).

The only other peculiarity about eyes affected with x-ray cataract has been ampulliform dilatations of the vessels of the bulbar conjunctiva, especially those in the lid interval and adjacent to the limbus. These telangectases are secondary reactions to the obliterating angiitis produced by the x-ray exposure. The posterior segment (uvea, retina, and optic nerve) is less sensitive to the rays than the lens, cornea, or conjunctiva.

The first experimental production of x-ray cataract in adult animals was simultaneously accomplished in 1928 by Aulamo[10] and Rohrschneider[11], and their results have been subsequently confirmed by several investigators (Schinz, Vogt[12], Peter[7]. Earlier research by Chalupecky (1897), Birch-Hirschfeld (1904), Rauch (1914), and Rados and Schinz (1922) had elicited negative findings because of the insufficient period during which the animals were observed. Rohrschneider found that the shortest period between exposure and the appearance of the first histological changes in the lens (swelling of the fibers behinds the equator) was ninety-three days. The shortest period for the production of posterior polar opacity was 130 days using 250 percent skin erythema dose (Peter). With 400-600 percent skin erythema dose, other evidences of irritation were produced,—blepharitis, keratitis, epilation, pigmentary changes in the iris, and total lenticular opacity.

The rabbit's eye is relatively less sensitive to x-ray than that of man. Jacoby demonstrated that the damaging dose for the human cornea is 120 percent skin erythema dose, while for the rabbit's cornea it is twice as much. The epilation dose in rabbits is 200 percent human skin erythema dose, corresponding to 900-1000 röntgens (r) of pure primary radiation measured in air. If the delivered dose is below this, no microscopic changes occur, even after six to seven months. The x-rays are about twice as injurious to the lens as to the cornea and conjunctiva, and by using suitable doses cataract can be produced without changes in the lids or cornea. If the epilation dose is divided and administered at bi-weekly intervals, cataract still develops, while the hair does not react until the total dosage has been increased to almost double the standard epilation dose.

The experimental x-ray cataract in rabbits first appears in the posterior cortical layer as a fine reticular opacity of

irregular outline (in this respect differing from the x-ray cataract of man) and extends very slowly towards the periphery. Fine vacuoles appear at this time under the anterior lens capsule. Paraffin sections reveal an undamaged capsule and no demonstrable changes in the chorioid or ciliary body. These experiments on x-ray cataract have been repeated by Goldman in rats, and by Kleiber in guinea pigs with similar results. Previously, von Hippel (1905) had rayed pregnant rabbits, and Bossuet (1909) pregnant guinea pigs, with the production of central and lamellar cataracts in the offspring. The radiosensitiveness of the conjunctiva, eyelids, cornea, and iris is only slightly greater in young than in adult animals, but the susceptibility of the crystalline lens is much greater. Tribondeau and Belley[13] (1907) noted alterations in the lenses of newborn animals thirty-three days following irradiation. Discrete vacuoles first appeared in the periphery of the lens, which gradually coalesced to form granular plaques that continued to spread throughout the lens until the entire structure became opaque. The capsule became increasingly thickened and atrophy of the lens finally supervened.

The cataract produced by radium is in practically all respects like the x-ray type. Quick[14] reported four cases in which cataract followed radium treatment of vernal catarrh. These patients were ten, eleven, thirty-five, and forty-five years of age respectively. Three of the cases had three seasons of treatment. In two of them cataract developed after four years, and in one after eight years. The fourth patient, a woman forty-five years of age, who had two treatments with suberythemal doses, developed bilateral cataracts five years later. Meesmann's[15] patient, twenty-seven years old, received two treatments of radium of three hours duration for an indolent ulcerative condition of the lid. The vision of the affected eye was then 20/20. Two years later its sight was reduced to 10/200, and examination disclosed the typical opacity in the lens. De Schweinitz and Baer[1] presented a case in which radium had been used for the destruction of an epibulbar sarcoma. In a series of rabbits treated with radium, Peter found the smallest dose effective in producing the characteristic lenticular changes was 144 mg. hrs., and the latent period in this instance was 5⅓ months.

Very similar to x-ray and radium cataract is the fire-cataract frequent among glass-blowers, tin-plate rollers, furnace-men, puddlers, foundry-men, and chain-makers. The incidence in glass-workers has decreased in late years with the replacement of mouth-blowing by machine-blowing. In a recent study, Kraupa[16] found that cataract is four times more common in glassblowers over fifty years of age, than in the general population of the same age. The surgical prognosis is good; in seventy-one of ninety-one operated cases 20/20 vision was secured. Older workers are particularly subject, especially those with ten to twenty years service (Rollet[17]). Fradkin[18] found typical fire-cataract in two Russian bakers, aged thirty-three and thirty-nine years, who had been thus employed for eight and twenty-seven years respectively. Vogt[12] proved that fire-cataract is not caused by visible or ultraviolet light, but by the short-waved infrared from 7500 to 24,000 Ångstrom units. He produced a total cataract in a rabbit's eye by exposing it to these infrared rays for three hours. The next morning there were distinct anterior and posterior cortical opacities. The sclerosing lenses of older individuals absorb more of the infrared light, and hence older people are more subject to fire-cataract. Especially characteristic of human fire-cataract, when present, is detachment of the zonular lamellæ of the anterior capsule. The thickness of the detached lamellæ is greater than occurs in senile detachment, in which but the fine superficial lamellæ are involved.

Igersheimer considers the lens opacities produced by lightning and electric short-circuits as but a special form of infrared cataract. The opacity does not appear until several months after the injury, and may be either total, or confined to the anterior and posterior cortical layers. In Holloway's report[19], a boy of twelve years of age received a

shock of 2200 volts. He complained of poor eyesight nineteen months after the accident. Both lenses were extracted ten months later, with a resulting vision of R.E. 20/40; L.E. 20/20.

Fig. 1 (After Rohrschneider). Note the plaque-like opacity in the posterior cortex of the lens, bordered by a zone of powdery opacity. The meshes of the recticular clouding are filled with moderate sized vacuoles.

All our present evidence is against ultraviolet light as a factor in the production of human cataract. Meesmann[18] had cases in which the Finsen light had been used over 300 hours on the lids without any damage to the eye. Of thirty-six cases of lupus, in which all were treated with the Finsen rays, sixteen with the Kromayer lamp, and two with x-ray, only the last two developed cataract. Scotti[20], experimenting on rabbits, found that ultraviolet in less than three hours exposure produced no changes in the lens. Longer exposures caused the transitory appearance of vacuoles in the capsular epithelium, and later in the cortex. A minimum of twelve hours of continuous radiation was necessary to produce permanent changes, which were apparently due to a direct coagulating effect on the protoplasm of the capsular cells. Accordingly, he concludes that ultraviolet can be discounted as an agent for the production of senile cataract.

We are still in the field of conjecture as to the biochemical or biophysical mechanism involved in the production of radiational cataract. The more vulnerable lens fibers may be directly damaged; or a disturbance of the lens metabolism may be involved; or the capsular epithelium be pathologically affected; or the changes may be secondary to some as yet undemonstrated damage to the ciliary body. Scheerer advises for the avoidance of x-ray cataract that no more than 80 percent of the skin erythema dose be given in the course of a year. The entire vicinity of the eyes should be covered with lead plates, or the bulb under the lids should be protected with a ray-opaque prothesis. The physician must also think of the secondary radiations that may emanate from the immediate surroundings of the protected area. Rohrschneider has devised a mercury-filled prothesis to be placed over the bulb. Cremer[21] prefers a helmet-shaped glass shell, constructed like a contact glass, covered

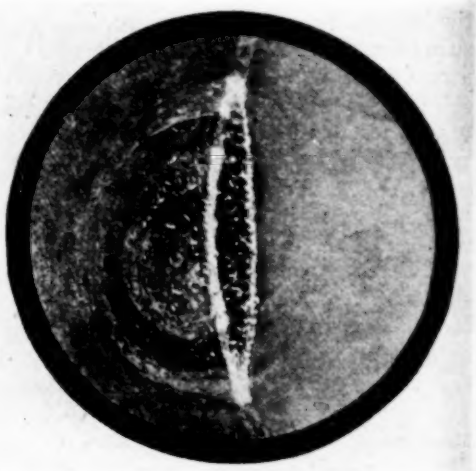

Fig. 2 (Lebensohn). With the narrowed beam, the posterior polar opacity is of plano-convex form, bordered anteriorly and posteriorly by a denser opaque layer, and is rather sharply demarcated from the normal cortex.

with .75 mm. thickness of gold-foil, as being thinner, more convenient, and equally effective. Desjardins,[22] in a recent article, minimizes the danger of x-ray cataract, but his views are based

on the older literature, and he has entirely overlooked the recent and convincing work of the German investigators. For those engaged in the industries, in which fire-cataract is a hazard, Vogt recommends the wearing of ferro-oxydul glasses.

In the past year two patients with radiational cataract came under my observation at the Illinois Eye and Ear Infirmary. The first patient was a woman of twenty-six years of age, who had received intensive x-ray treatment for acne at the age of eighteen years. Six

Fig. 3 (Lebensohn). X-ray cataract. Case 1. Note the facial scarring and telangectases consequent to over-exposure to x-ray radiation.

years later, she complained of failing vision. Her eyesight is now R.E. 20/200; L.E. 20/100; and both lenses show the characteristic posterior cortical opacities of x-ray cataract. The other patient is a man, fifty-seven years old, who has had bilateral cataracts for ten years. He worked as an iron-molder in Sheffield, England, from the age of thirteen to thirty-seven. His vision now

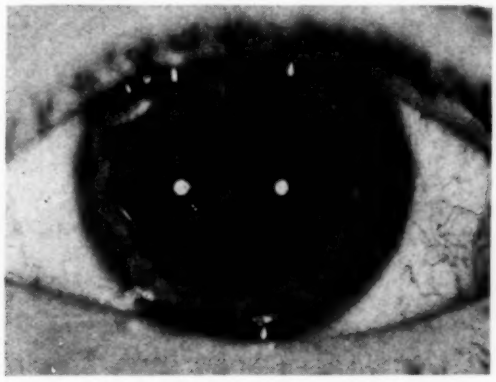

Fig. 4. (Lebensohn). Fire-cataract. Case 2.

is R.E. 5/200; L.E. 20/100. In each lens there is a posterior cortical opacity very similar to that in the first case, and in addition a well marked coronary cataract in the periphery. A careful study with the slitlamp showed no detachment of the zonular lamellæ.

Experimentally, Dr. Gifford and I have corroborated Aulamo and Rohrschneider's results. Of six adult rabbits radiated six months ago with 1000 roentgens, four now show macroscopically, typical lenticular findings.

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NOTES, CASES, INSTRUMENTS

AN IMPROVED TIP FOR THE ELECTROMAGNET

FREDERICK OSCAR SCHWARTZ
SAINT LOUIS

In the removal of magnetizable intraocular foreign bodies it becomes necessary at times to introduce one end of a slender instrument into the globe, and to place the other end in contact with the tip of the magnet for the better conduction of the magnetic force. Probes, forceps, and scissors, usually employed for this purpose, have certain disadvantages such as slipping, sliding, and clumsiness in manipulation; one's inability to introduce them at a proper or convenient angle, and rocking of the instruments due to the magnetic pull in several directions. This new, improved tip was designed for use with the giant electromagnet to correct these faul

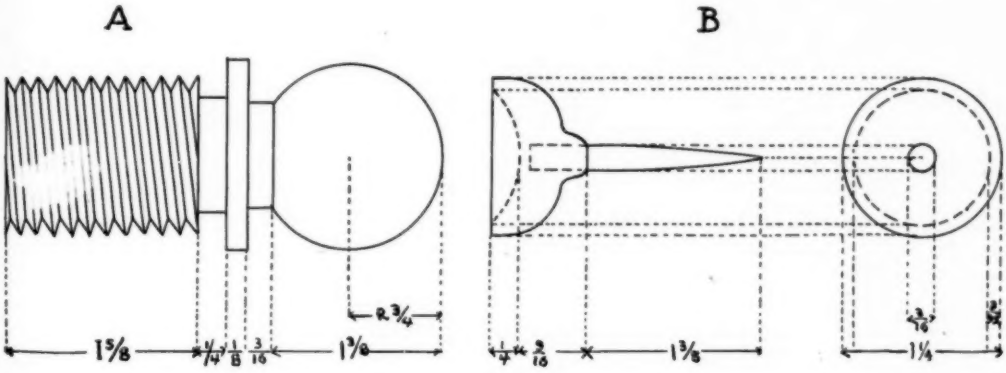

Fig. 1
(Measurements in inches)

It is made of steel and consists of two parts: One with a spherical head (fig. 1, A) to screw into the magnet core, and another with a concavo-convex spherical segment into which a pointed tapering pin is fixed (fig. 1, B). The concave surface of this segment is turned on the same radius as the spherical head, against which it is placed during operation, insuring maximum contact between these two surfaces at all times. Free movement of the segment over the sphere in all directions is obtained, permitting a flexibility of adaptation without the usual clumsiness and insecurity met with formerly. The tip of the pin is tapered to block egress of the intraocular parts after its introduction into the wound (fig. 2).

After sterilization, the tip is used in the following manner: The magnet is placed in position for operation and the spherical-headed portion screwed into place. The segment is placed over the sphere and held temporarily by one hand, with the pin directed at the most convenient angle for working. The point of the pin is now introduced into the globe and the current applied, the magnetic force causing the two pieces to adhere. If necessary, for a change in the working angle, the segment can be rotated or moved about upon the spherical head, while these two parts adhere

Fig. 2

to each other. From now on, the operator continues in his best, accustomed manner until the particle has been extracted.

The tip has been used successfully in several cases, over a period of two years.

As there are great differences in the sizes of various types of electromagnets, the dimensions of the tip given here are relative and optional. It may be made in any size to fit any magnet. The one illustrated was designed for my magnet which is unusually large, but only changes in the pitch and thread of the screw need be made to adapt it to any particular instrument.

508 North Grand boulevard.

GUIST BONE SPHERE

L. L. McCoy, M.D., F.A.C.S.
SEATTLE

After reading with considerable interest Allen's article "Guist's Bone Spheres" in the March, 1930, issue of the American Journal of Ophthalmology and noting that other surgeons were confronted with the same question as myself concerning the sterilization and insertion of these spheres, I am going to relate my experience in eight cases.

I have sterilized the spheres by placing them in test tubes and autoclaving them under fifteen pounds pressure twice for one hour each time at twelve hour intervals and have then kept them sterile until ready for use.

At operation, the usual simple enucleation is performed except that a fine catgut suture is threaded through each muscle near its insertion and tied, the ends being held by a hemostat before the tendon is severed. When the cone lined by Tenon's capsule is free from oozing, its mouth is widely opened and the sphere inserted with the gloved fingers and pushed firmly down into the apex. No special type of sphere introducer is necessary. Handling the sphere with the fingers and holding it firmly in the socket with a wooden applicator prevents crumbling. It is held in place with some such object while Tenon's capsule is sutured with catgut and the opposing muscle sutures are tied across. The conjunctiva is then closed by a silk purse string suture. The toilet of the wound is completed and a firm dressing applied.

Of the eight cases thus treated, one sphere sloughed out on the ninth day and the wound healed very rapidly. The wound gaped slightly in three others, one completely healed over in a short time, one is slowly closing in and the last is of too recent date to predict the outcome. In all cases, there has been considerably more discomfort for from two to five days following operation than occurs after simple enucleation without implant. Only one case showed any unusual tissue reaction and that may have been due partly to a poor general condition of the patient associated with very high blood pressure. Otherwise the reactions have been no different from those following simple enucleation.

The results have been most gratifying. Unusually good range of movement and comfort are secured from ordinary stock eyes of the reform type. Women patients, especially, greatly appreciate the good appearance secured by this operation. I feel that these Guist bone spheres are much superior to any other type of implant.

817 Summit avenue.

SOCIETY PROCEEDINGS

Edited by Dr. H. Rommel Hildreth

COLLEGE OF PHYSICIANS OF PHILADELPHIA

Section on ophthalmology

November 19, 1931

Dr. H. Maxwell Langdon, chairman

Sarcoma of the choroid

Dr. T. B. Holloway presented a man aged twenty-three years, whose right eye had been struck by a hammer three years ago. The accident was not followed by any inflammatory reaction. The eye remained quiet for a year, then the vision of this eye became impaired and had grown steadily worse.

The external examination was negative. There were a few vitreous opacities. Beginning about one-half disc-diameter from the temporal side of the disc, there was a large, round and well circumscribed detachment of the retina that extended over the macular region and far towards the periphery of the fundus. At the extreme limit outwards, one could note a small, disc-sized choroidal erosion just below the horizontal meridian. Deep vessels over the summit of the growth were rather conspicuous and in several places small vague areas of pigmentation were seen. The apex of the detachment could be clearly seen with a plus 20 D. lens. The field defect corresponded with the retinal pathology. He thought the condition typical of sarcoma. Enucleation had been advised. The left eye was normal.

Bilateral optic atrophy due to methyl alcohol poisoning

Dr. Charles E. G. Shannon presented the case of Mr. H., aged twenty-one years, who drank one-half glass of what was supposed to be gin, on May 1, 1931. Two hours later he suffered from acute gastritis, with vomiting and severe pains in the abdomen. On the following morning he again vomited four times and on the same evening and through the night he vomited at frequent intervals. Thirty-six hours after the drinking of the gin, he noticed for the first time that his vision was affected. He was then rushed to the hospital and within a short time following his arrival, he noted a marked impairment of vision and soon afterwards he went completely blind. There had been no return of vision since. About four months later, Dr. Shannon found the following: No light perception in either eye; widely dilated pupils, unresponsive to light. The media were clear; discs white with deep glaucomatous-like excavations. The arteries were narrowed. The maculæ and peripheries of the fundi exhibited no abnormalities of note. The tension was 15 mm. in the right eye and 18 mm. in the left (Schiötz).

Because of the severe symptoms shortly following the ingestion of the drink, it seemed reasonably safe to conclude that the gin must have contained methyl alcohol. Curiously, three of his companions imbibed as freely as he did, one suffered abdominal distress, but in none of them was the vision affected.

The interesting feature of the fundus picture was the extraordinary excavation of the disc. Dr. de Schweinitz quoted Schnabel, in the discussion of glaucomatous excavation, as stating that the excavation was due rather to a degenerative process than from pressure, which could account for the cupping in this case. This young man had always been in excellent health. His present appearance, his age, and tension as recorded by the tonometer, would exclude glaucoma as an etiologic factor.

In methyl alcohol poisoning, some persons were largely immune from permanent damage. Only one of the four here reported was seriously affected. Wood had stated that "if ten persons drink, say four ounces of wood alcohol, within three hours all will have marked abdominal distress, and probably four

will die, two of them becoming blind before death".

The exact pathological action of methyl alcohol is unknown; it is not so easily eliminated from the body and oxidized as ethyl alcohol. Apparently small and frequent doses tend to a cumulative effect, resulting in serious damage to digestive, visual, and nervous system. According to Wood, there is a destructive inflammation of the optic nerve fibers or retinal elements (or both) followed by atrophy. In this patient, the atrophy would suggest a primary form of a distinctly degenerative character.

Discussion. Dr. William Zentmayer said that Dr. Percy Friedenberg, many years ago, had published his observations on the optic nerve head in methyl alcohol amaurosis, in which he described the condition present in the case shown by Dr. Shannon. In addition to the excavation, he found in one case an increase of glial tissue in the bottom of the cup, but in all the other instances there was an extrapapillary overgrowth of glial tissue.

There was a difference of opinion as to the primary effect of the alcohol, whether it was on the ganglion cells of the retina or whether it was an effect on the nerve fibers or the interstitial substance. Jonas Friedenwald's experimental work indicated that the whole nerve was involved. A research Fellow of the Rockefeller Foundation had stated that if animals poisoned with methyl alcohol were kept in the dark, blindness did not supervene.

Dr. George E. de Schweinitz stated that he had also noted in the subjects of methyl alcohol blindness, excavation of the nerve-head, simulating a glaucoma-cup, originally described by Percy Friedenberg, but never so perfectly developed as in Dr. Shannon's patient.

He referred to the fact that the amount of wood alcohol necessary to produce blindness varied considerably; two to five drams had caused blindness, as occurred in one of his own patients, while recovery after drinking one-half pint, or even larger quantities, had been observed. In short, methyl alcohol intoxication was a typical example of idiosyncrasy.

The poisoning might be due not only to drinking, but also to inhalation and cutaneous absorption, as had been experimentally demonstrated. The blindness had been attributed to nutritional changes in the retinal ganglion cells (Ward Holden, Birch-Hirschfeld, Henry Smythe, and others, here and abroad), but their experimental results were not confirmed by other investigators (Jonas Friedenwald and A. Felty in Baltimore, Fewell and Perce De Long at the University of Pennsylvania). It was possible that the poison attacked the entire nerve.

The toxemia had also been attributed, he said, not to the methanol itself, but to adulterants, such as fusel oil, and to imperfect combusion of the alcohol in the system, with the production of formaldehyde. But Reid Hunt's analyses had demonstrated that the chief toxicity belonged to the methyl alcohol. The whole subject from the experimental standpoint should be reviewed.

Dr. T. B. Holloway said that the amount of methyl alcohol ingested and absorbed was more important than the question of idiosyncrasy. Generally those patients who had vomited freely did not suffer to the same extent as those who retained the poison.

The recession operation in squint

Dr. Luther C. Peter presented a paper upon this subject. He said that the procedure of uncontrolled tenotomy had given way to the more rational method of suture recession, which was a safeguard against subsequent convergence insufficiency and the tendency to paralytic squint in the opposite direction.

The important steps of his operation consisted of the following: (1) A vertical incision in the conjunctiva 1 mm. back of the point of the muscle insertion. (2) Subconjunctival dissection towards the canthus. (3) Introduction of a tendon hook with slight freeing of the muscle insertion from the capsule. (4) A double armed whip-stitch introduced near the upper and lower borders of

the tendon close to the muscle hook, from without in, so as to grasp the muscle properly and spread it upon the sclera. (5) Cutting the tendon, leaving 1 mm. of stump. (6) Two millimeter bites in the superficial sclera, widely separated, so as to spread the tendon on the sclera. (7) Passing the suture through the tendon stump, 3 mm. apart, and through the conjunctiva anterior to the stump. (8) Tying of the suture in a loop, after drawing up the tendon to its proper place. (9) Closing of the conjunctiva and sclera by a running untied suture. The conjunctival suture was removed on the fifth day, and the scleral suture on the seventh day following the operation.

The essential difference between this and the Jameson suture, lay in the use of No. 1 silk, instead of catgut, which admitted the use of a very fine needle, thus causing less trauma to the sclera. All the strain of the suture was placed on the tendon stump. Tying the suture by means of a loop permitted adjustment on the second or third day, if necessary.

In the correction of moderate degrees of squint, advancement of the long muscle should be given the preference over recession. In squint of high degree, or in such instances in which more than one surgical procedure became necessary, the recession suture logically became a supplementary operation of much value. In esophoria and exophoria, the choice of operations was largely determined by the ratio of abduction to adduction. In esophoria when abduction was excessively low, it was wise to increase the power of the external rectus. Conversely, if adduction was excessive, and abduction normal, a recession of the internal rectus was indicated.

Discussion. Dr. Warren Reese said that he had been doing this operation with success for the past ten years. He felt that it was an advantage to select a technic requiring only one scleral stitch, as there had been several unfortunate cases reported of perforation of the globe. The danger was slight if the needle could be seen while passing through the sclera. This step was facilitated if modern pressure was made on the globe.

The ophthalmological importance of focal infective prostatitis

Dr. P. S. Pelouze (by invitation) presented a paper on this subject. He said that the extent to which the various focal infective eye conditions might be influenced by infections of the prostate gland, was not generally recognized. While many eye conditions were caused by dental, tonsillar or sinus infections, they rather commonly failed to improve after attention to the focus of infection because there was an infection in the prostate.

Comparatively few cases of prostatitis had any relation to gonorrhea, but were predominately secondary to tonsillar or dental infections. At least 35 percent of all males past thirty-five years of age had an infected prostate gland. At least 72 percent of all males exhibiting symptoms of focal infection had prostatitis; 69 percent of these had infected tonsils and 61 percent had infected dental roots. Moreover, 64 percent of those who had infected teeth extracted, had further dental infection within two years.

Gentle massage of the infected prostate gland usually would cause an increase in the ocular symptoms. If such a reaction did not follow one of the first few massages of the gland, there was in all probability no relation between the eye lesion and the prostatic infection. These responses were analogous to a vaccine reaction. Great ocular damage could be done by rough prostatic manipulations, for which reason few treatment procedures required more gentleness and judgment. These massages should not be repeated more often than twice a week, and if the eye condition was growing worse because of them, they should be discontinued until the eye improved or reached a stationary stage.

Recurrences of the ocular lesion were more likely to be due to focal infections other than in the prostate. Commonly prostatic reinfection recurred as the result of later dental infection, which might prevent cure of the eye

lesion despite attention to the teeth.

The diagnosis of prostatic infection was made by the finding of pus in the prostatic secretion, not by rectal palpation alone.

Discussion. Dr. de Schweinitz differed somewhat with the essayist's opinion as to gonococcal iritis, which was a perfectly well-established form of iridocyclitis, chiefly plastic in type, which might be associated with, or follow, an arthritis, due to the influence of gonococci (or perhaps their toxins) on the anterior uveal tract; indeed in these circumstances, the gonococci had been recovered from the anterior chamber by Sidley-Huguenin. This form of iridocyclitis was favorably influenced by the administration of large doses of gonococcic vaccine (Neisser bacterin).

A. G. Fewell,
Secretary.

LOS ANGELES SOCIETY OF OPHTHALMOLOGY AND OTOLARYNGOLOGY

March 28, 1932

Dr. Frank Friesen, president

Drusen of the papilla

Dr. John P. Lordan demonstrated two patients affected with drusen of the papillæ. The first patient, a man twenty-eight years of age, had shown no symptoms of ocular trouble except a gradually increasing myopia over a period of four years. With correction, the visual acuity was normal in each eye. Examination of each fundus showed a conglomerate mass of highly refractile white nodules on each disc. With the binocular Gullstrand ophthalmoscope this tissue was seen to bulge forward, giving an appearance similar to that of papilledema, except that the disc had an irregular surface. A small patch of retinochoroidal atrophy to the nasal side of each disc was observed. The visual fields were normal. The second man was forty-eight years of age and showed a much smaller number of drusen in each papilla. Here the visual acuity was also normal, but there was a slight general contraction of the fields.

From a review of reported cases it was pointed out that drusen of the papilla might exist in otherwise normal eyes, but that in many cases drusen were associated with optic atrophy, optic neuritis, papilledema, and pigmentary degeneration of the retina. For this reason much care should be spent in the examination of patients so afflicted in order that other coexisting pathological changes in the nerve, which might be masked by the drusen, should not be overlooked.

Dr. Lordan stated that the present conception of the pathogenesis of drusen in the papilla was that they arose in a manner similar to those in the choroid, their origin being related to the pigment epithelium. Such pigment epithelium was said to exist in the disc, anterior to the lamina cribosa, thus rendering drusen formation possible in this location.

The differential points between drusen and hyaloid bodies in the disc were described. In the two cases presented, the prognosis was considered favorable as no visual disturbance had been produced. Drusen did not primarily produce visual disturbances, because their development was so slow that the nerve fibers and vessels had time to adapt themselves to the changes in contour without being physiologically interrupted.

Discussion. Dr. M. F. Weymann said that he had examined both patients presented and that clinically the important point was to be sure that the presence of the drusen did not cause one to overlook other changes in the disc. He recalled that Dr. Peter had pointed out that hyalin excrescences on the posterior surface of the cornea were an indication of a tendency toward degenerative changes in an eye, and that drusen might be considered in the same light. Therefore, the patient with progressive myopia should be carefully controlled as to his near work and general health, for although the presence of the drusen might not have any primary relationship to the myopia, they

might indicate that such an eye would be affected by overstrain more rapidly than a normal one.

DR. CLIFFORD WALKER recalled the presentation of Dr. Parker Heath, in which drusen were considered as associated with lipoid degeneration. Accordingly, drusen of the papilla might be considered as a form of fatty degeneration in this region. Careful perimetric studies should be made on patients so afflicted.

Anterior chamber puncture

DR. S. V. ABRAHAM briefly reported the procedure of anterior chamber puncture as used by Kronfeld for the early diagnosis of chronic simple glaucoma. The danger of a new test for the diagnosis of glaucoma was always that of incorrect diagnosis, with its resultant unnecessary treatment and hardship to the patient. In both animal and human eyes examined after emptying the anterior chamber by puncture, hyperemia, and edema of the ciliary body were found. According to experimental work, atropin and adrenalin lowered the response to puncture, in the tension of animal eyes. Kronfeld's selection of four patients in 1928, for obtaining a normal tension curve after puncture was criticized in that the eyes selected were affected with amblyopia or optic atrophy. Dr. Abraham presented the curve obtained by him from several eyes in which he was certain that no disease existed which might lower the function of the ciliary body. In these eyes the tension after puncture rose to from 35 mm. to 60 mm., thus giving a positive test. However, even after prolonged observation, none of these eyes had developed visual field changes or any other confirmatory evidence of a glaucomatous condition.

In one patient, twenty-five years of age, the observation was most striking, in that one eye which was normal had a rise to 35 mm. after puncture, while the second eye which was affected with a myopic choroiditis did not give a positive response to the test.

It would therefore seem that any eye with a normally functioning ciliary body showed rise in tension above normal subsequent to puncture and drainage of the anterior chamber, whereas eyes affected with disease which would impair the function of the ciliary body would tend to show no rise in tension above normal and give a curve similar to that determined by Kronfeld as the curve for an eye not affected with glaucoma. It followed, then, that this test for the determination of chronic simple glaucoma in its early stages was not reliable.

Discussion. DR. WILLIAM BOYCE stated that he had heard Dr. Kronfeld's report of over one hundred cases in which this method was used and that he was impressed favorably with the procedure as a diagnostic method in borderline cases of chronic simple glaucoma. His impression was that Dr. Kronfeld's experiments had been adequately controlled and that the reports of cases were trustworthy.

DR. CLIFFORD WALKER thought that the risk of the procedure was too great for the value of the information to be obtained. Two types of injury might be possible, first from puncture, such as infection or injury to the lens, and second, the cornea could be traumatized from repeated tonometric applications. If injury occurred, it might be difficult from a medicolegal standpoint to escape responsibility.

DR. ABRAHAM reported that, in his experience, no patients who were diagnosed as having chronic simple glaucoma solely by this method, and had no field or other changes due to this disease before the puncture test, developed any subsequent clinical signs of glaucoma; nor had Kronfeld ever presented such a case. Two of the original patients diagnosed as positive by the puncture technique were observed carefully by Dr. Abraham over a period of about two years, and neither of them had ever developed field changes or other clinical signs of glaucoma.

M. F. WEYMANN,
Recorder.

CHICAGO OPHTHALMOLOGICAL SOCIETY

February 15, 1932

DR. FRANK BRAWLEY, president

Benign adenoma of ciliary body

DR. J. T. STOUGH said that the patient on whom this report was made, a woman thirty-nine years of age, had died of general metastasis following mastectomy six weeks before. The eyes were removed at autopsy. The interesting factor was the accidental finding of a hypophyseal adenoma and also a small nodular hyperplasia of the nonpigmented epithelium of the ciliary body. This resembled an adenoma in cross-section, but was in no way related to that of the hypophysis. Such a nodule had been called an adenoma but of benign type, by a number of those reporting such cases.

Some thirty cases had been cited in the literature, mostly in old individuals. Aside from this finding the eyes were generally normal. The tumors were usually .3 mm. to 1 mm. in size, though the one reported by Coats was approximately 5 mm. in size, due to cystic-like enlargement extending into the intercellular substance of the iris. Velhagen, who reported the youngest patient, aged thirty-eight years, enucleated the eye because of glaucoma from choroiditis, and found such a tumor with many bud-like proliferations.

In typical cases such as the one presented, the nonpigmented epithelium burst through the pigmented layer in a ball or kidney-shaped proliferation and grew in bands and folds, strands or tubular formation with a homogeneous intercellular substance, the whole pushing aside the ciliary processes. The surrounding tissues showed no reaction and no blood vessels were found in the tumor. There was no actual lumen though sometimes the cells became vacuolated and coalesced, causing larger vacuoles to appear. The supporting tissue was homogeneous and did not take a positive stain, but with Van Giesen stain was slightly redder than the connective tissue of the ciliary body. The condition had been summed up by Wunderlich in saying that we were dealing with a benign epithelial tumor of unknown origin, occurring in old individuals. Inflammatory processes, glaucoma, or injuries might play a rôle.

Blood staining of the cornea

DR. J. E. LEBENSOHN presented a child, four years of age, who came to the Infirmary on September 9, 1931. At that time the anterior chamber of the right eye was filled with blood and there was epistaxis from the right nostril. There was no history of injury but it was probable that the child had had a fall. Atropin was instilled in the eye. The iris could not be seen on account of the blood. Ten days later there was an opacity almost covering the entire cornea, of greenish-brown color. The opacity had since gradually diminished in size. It was still sharply bordered and there was now about 3 mm. of clear space from its margins; the color had changed to a cream-yellow. One could now see through the anterior chamber that there was a tear in the upper part of the iris, from which a fibrous exudate extended over the upper part of the iris and pupil.

There was an excellent description of this condition in the American Encyclopedia of Ophthalmology. At the time of the hyphemia there probably occurred a break in Descemet's membrane which allowed the blood to seep into the cornea.

Thrombosis of the retinal vein

DR. J. E. LEBENSOHN showed two patients. The first case involved the right eye. Three months ago the patient noted loss of vision in that eye one afternoon while reading. The systemic diagnosis was myocarditis with decompensation. The urine was loaded with albumen. The ophthalmoscopic picture showed typical hemorrhages extending over the retinal exudates and leech-like dilatations of the veins.

The other case was one of thrombosis of the inferior branch of the left central

vein. Three weeks ago the patient noted a sudden loss of vision. He saw quite well below, in the left eye, but nothing above. The blood pressure was high and the urine showed much albumen. Altitudinal anopsia always meant a circulatory lesion, while lateral anopsia was significant of a nervous lesion.

Tribromethanol (avertin) as an anesthetic in eye surgery

Dr. Frederick A. Davis read a paper on this subject, published in the March, 1932, issue of the American Journal of Ophthalmology.

Discussion. Dr. Frederick A. Davis closing) said in reply to Dr. Folk, it was true that the head nurse did not like to have to keep a nurse with the patient all night. It was being done as a matter of precaution, but it might not be necessary. At the University of Wisconsin anesthesia was given by physicians but there was no reason why nurses could not give it as administration was simple if directions were carefully followed and overdosage avoided. There were no serious complications in this series of cases and it would seem to be as safe as ether. Of course there was the disadvantage that the drug was all administered at one time and could not be withdrawn, but by watching the blood pressure and respirations carefully there did not seem to be any great danger.

In reply to Dr. Goldenburg, as stated in the paper, the period of sleep might be shortened by intravenous injections of ephedrine, according to reports by Raginsky and Bourne of McGill University. They had done considerable experimental work, chiefly on dogs, in which they had found that the anesthesia might be interrupted or shortened by the administration of ephedrine. They stated that the corneal reflex returned in from one to two minutes, becoming very active with spontaneous blinking; the dogs began to move their heads and in about five minutes after the injection vigorously attempted to get off the table. Most of the work had been experimental on dogs, but in a few instances they had tried it on surgical patients. The effect was similiar, though there was not the sudden awakening observed as in dogs. Dosage was being reduced as much as possible to produce the desired result, but it could not be reduced too low or the patient would not remain quiet.

In reply to Dr. Halper, children did not seem to be as well anesthetized by the ordinary dose. Possibly this was because the operation was usually for strabismus, which produced more pain. It had been mentioned by practically everyone that children were less susceptible to the drug.

Replying to Dr. Fralick, an experience similar to his was noted in one of this series of cases, a vigorous young laborer failed to go to sleep after the administration of the usual dose of avertin. The dose was even doubled and the patient still failed to go to sleep. Some days later the ordinary preliminary sedative, 1/6 grain of morphine and 1/150 grain of scopolamine, was administered hypodermically one and three-fourths hours preoperatively, followed by the usual dosage of avertin, and within five minutes the patient had fallen into a deep sleep. It appeared that his failure to go to sleep in the first instance was due to the fact that no preliminary sedative was used, and it was felt that this was important. More than seventy percent of the patients in this series of cases received no supplementary anesthesia, but most of them received some preliminary sedative. Avertin seemed particularly suited to eye surgery, since a supplementary local anesthetic, three or four drops of cocain solution, was so easily administered and was usually sufficient to anesthetize the eye. The avertin acted as a sleep producer, relieving the patient of nervous anxiety and preventing sudden movements of the eye.

In answer to Dr. Allen, the question as to whether a postoperative hemorrhage might occur with the recurrence of normal tension was pertinent, and had been given much thought. In one of the earlier cases there was a postoperative hemorrhage into the anterior chamber of the eye. The patient was an

excitable woman, deaf and dumb, and extremely hard to handle after regaining consciousness. At the time, it was thought a sudden rise in tension postoperatively, following the anesthesia, might have had something to do with the hemorrhage. This case had already been reported in a previous paper. In the light of later experience with some 150 cases it seemed unlikely that the hemorrhage should be attributed to this factor.

It had not been possible to make accurate tonometric readings in the postoperative hours. It was possible that pressure might rise with the rise of venous pressure. The patient did not regain consciousness for ten hours, and laid very quiet, hardly moving a muscle. Breathing was almost imperceptible, that was one of the most striking features connected with the use of the drug. Sometimes the patient appeared to have stopped breathing, but on examination of the respiratory rate it was found to be normal. There had never been an iris prolapse among the forty extractions that had been done.

Dr. Brawley asked about contra-indications. It was said to be contra-indicated in the aged, although in this series a patient eighty-seven years old was operated upon. Kidney or liver disturbances were ordinarily contra-indications. There had been considerable experimental work along these lines, however, and present indications were to the effect that avertin produced no greater damage than ether. In a previous paper it had been shown that in some cases albumen in the urine had disappeared following administration of avertin, and this fact had also been reported by others. A few patients had shown slightly more albumen. Dr. Waters had anesthetized patients who had gallbladder and liver disease and reported no untoward effects.

In a patient in whom an abrupt fall of blood pressure should be avoided the use of avertin might be contra-indicated. It had been recommended in operations for exophthalmic goiter by English surgeons. It did not affect the heart muscle and did not influence the circulation.

The effect of tryparsamid on the eye. An experimental study and report of a case

Drs. N. K. Lazar and A. Wiel read a paper on this subject. A summary states that rabbits weighing four to six pounds given intravenous injections of tryparsamid at weekly intervals starting with 0.2 gram up to and including 1.5 grams showed no changes on microscopic examination of the eyes with various stains. The brain chiasm and optic nerve of a rabbit given one injection of 1.5 grams of tryparsamid showed numerous changes, principally a hemorrhagic leptomeningitis with round cell infiltration.

One case was reported of lues of the central nervous system. No changes could be ascertained which could be ascribed to the tryparsamid treatment.

Radiational cataract

Dr. James Lebensohn read a paper on this subject which will be published in this Journal.

Discussion. Dr. Robert Von Der Heydt recalled a case he had presented twenty-three years ago before this society. It was a "glassblower's" cataract, in a baker who had been exposed to the fire of the oven for thirty years.

The two cases shown this evening, the one a "fire cataract" which came on twenty years after the man quit work, following a period of sixteen years as an iron moulder; the other a morphologically similar lens involvement years after x-ray treatment for rosacea, both illustrated the delay of onset and progression. Those cataracts caused by infrared rays first involved the posterior polar cortex. The nucleus, because of its sclerosis, and the equatorial lens area, by being covered by iris tissue, were not involved in radiational cataract.

Dr. Frank Brawley said that the points brought out by Dr. Lebensohn seemed to have a medicolegal significance. We would have to be circumspect in discussing these matters with patients, and think well before giving an opinion.

Robert von der Heydt,
Secretary.

AMERICAN JOURNAL OF OPHTHALMOLOGY

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DROPS IN THE EYES

Of the men who lie awake trying to decide whether to operate for a detached retina, or about adopting a certain technic for cataract operations, how many give a thought to the method of putting drops in the eyes of a patient? Yet the latter will be important to one thousand patients for every one who will need either of the operations mentioned; and the drops may affect the success of any operation. The doctor who thinks little about the matter naturally leaves "drops in the eyes" to the uninstructed nurse or mother. He takes the attitude toward drops, of Dogberry in Shakespeare's play, who says: "To write and read come by nature". If it comes by nature, who can expect the doctor to waste his time to teach a mother, or nurse, how to put drops in the eye?

The first drop of the local anesthetic may decide the success, or failure of the operation. The dropper, held too far above the eye, the cocain solution a little too warm, or too cold, the drop strikes the eye with a distinct shock. The patient tense, and the eye full of tears with the excitement, the eye squeezes shut, the bulk of solution goes out of the eye, and there is no anesthesia. The surgeon, conscious of other operations he must do in the hour, proceeds to inject novocain in spite of the complaints and contortions of the patient; and cooperation necessary for the operation becomes impossible for that patient. Before it is over the surgeon may be in a condition that makes a good operation impossible.

Drops to produce cycloplegia, mydriasis, or miosis must penetrate the cornea and enter the aqueous humor. A grain of atropin absorbed through the conjunctiva has less effect on the pupil, or ciliary body, than if it had been injected into the arm.

To produce cycloplegia, a sufficiently concentrated solution of atropin must remain in contact with the cornea, long enough for the drug to be absorbed into the corneal tissue, whence it will diffuse into the aqueous humor. No amount of it, poured into the conjunc-

tiva to be absorbed into conjunctival vessels and the general circulation; or run through the lacrimal passages, drying the throat, or causing atropin poisoning, will have the desired effect on the iris, or ciliary muscle. In similar fashion a nurse, putting eserin drops in the eye of a glaucoma patient, may be effectively contracting the pupil, or causing agony from ciliary spasm; according to the knowledge of the effects of eserin that has "come by nature" to the doctor who prescribed it. If practiced like the ritual, which proved effective in bringing "votive offerings" in Greek temples, before the days of Hippocrates; it may be as useful when practiced by a nurse in white uniform, as by a doctor, who has a diploma from a Class A medical school.

To the doctor who is trying to make scientific observations, each drop instilled in the eye is an opportunity to learn something about that eye and the patient; and perhaps something that he has not observed about any eye, or patient before. Observations can be significant, even when one does not have a knife in one hand and forceps in the other. The frequency and importance, even of idiosyncrasy, is worth knowing.

A drop of homatropin solution, placed on the upper limbus, spreads rapidly over the whole cornea and can be watched until it is evenly diffused over the surface. If there is a spasmodic attempt to close the lids, it may be due to shock of the drops falling more than an inch or two, or from the solution being too warm or too cold, or to the neurotic condition of the patient. An acid solution of the drug, or a drop from the wrong bottle, containing an irritating solution, will provoke closure and squeezing of the lids a little later. At least the physician who instils such drops and watches the effects, gets an idea of the efficiency of each application; and can judge better as to the significance of unusual symptoms that may appear, or the number of instillations and time that will be required to secure the maximum effect. It is not a waste of time to become better acquainted with the patient, even if one does not intend to extract a cataract, or make a diagnosis of brain tumor.

Drops are put into the eye for other purposes than to cause cycloplegia; and for each different purpose differences of technic are needed to make the application most effective. If this duty is left to the nurse, or mother, that person should be instructed how to do it. A doctor sent a girl home stating he would have the pupils dilated with one percent solution of atropin. She returned with the pupils of normal size; and reacting perfectly to light and accommodation; except that one pupil was a trace larger than the other. The bottle of drops was brought along. A drop from this bottle was placed on the upper edge of the cornea, and the upper lid held against the brow for a half minute. In ten minutes the pupil was widely dilated and fixed. In one hour the accommodation was fully paralyzed. The grandfather, who brought the child, watched the proceeding with evident interest. Then he said: "Yes, I put the drops in every time, three times a day. But I did not do it like you did."

Edward Jackson.

IMPERIAL EYES OF ROME

Life, even in those we call great, is made up chiefly of trifles. Hence it is not strange that the common run of mankind, having first displayed an excessive tendency to regard their leaders as something apart, colossal, and superhuman, proceed to find comfort in trifling details of the daily life of the great, or in peculiarities of personal appearance or habit.

We have been curious to know whether Lincoln was hyperopic and hyperphoric, whether Milton had syphilitic chorioretinitis or myopic degeneration of the fundus, what was meant by the statement that the dissolute and revolting Emperor Nero looked at the gladiatorial fights through an emerald, or what strength of minus sphere was worn by Johann Wolfgang Goethe.

"Homo sum: humani nihil a me alienum puto." ("I am a man, and regard nothing human as foreign to me.") Among the recreations of ophthalmolo-

gists may be counted the accumulation of details as to the eyes of characters in fiction, as to the treatment of ocular diseases by primitive man and in earlier civilizations, and concerning the ocular appearance and visual capacity of historical personages. More or less learned contributions of this character are frequently published by our contemporary, the Klinische Monatsblätter für Augenheilkunde. In small type, and occupying an insignificant position in that journal, it is nevertheless not impossible that these literary miscellanies are more widely read than the dissertations on pathology, surgery, and therapeutics.

Esser (Klinische Monatsblätter für Augenheilkunde, 1932, volume 88, page 535) has collected a series of quaint and interesting facts concerning the visual organ of Rome's long line of Caesars. One interpretation of the origin of the word "Caesar" itself is that it signified the possession of blue gray eyes by one of the forbears of Julius Caesar, who in effect if not in name was the first Roman emperor. The better known but perhaps no more weightily supported explanation is that Caius Julius Caesar was born by cesarean section.

The flattery of courtiers and historians was frequently applied to the supposedly imperial glance, and we find Augustus, the successor of Julius Caesar, taking pleasure in believing himself the possessor of eyes in which there was a divine fire, and that those who looked at him lowered their glance as before the light of the sun.

The Emperor Tiberius, at the age of fifty-six years, surrendered certain details of the executive office partly because of his age and partly because of the fact that he saw best by night and least by day. Pliny's account of the Emperor Claudius points to the existence of pterygium in both eyes. The same emperor, dying of poison administered in an edible mushroom, is described as having lost sight and hearing before his decease.

Many picturesque arguments, especially as to the early use of some sort of correcting lens, have been based upon the statement of Pliny (a not too conservative historian) that "Prince Nero watched the fights of the gladiators in an emerald," and another statement by the same author that "Nero's eyes, unless he blinked, were weak for near" (elsewhere interpreted to the effect that Nero's eyes were weak if he did not blink them in looking at near objects). Another passage has been taken to mean that Nero suffered from scintillating scotoma and migraine.

Vespasian did not ascend the throne until he was sixty years old, and his addresses to the Senate had to be read by his son. Domitian is described as having had weak sight but large eyes—perhaps myopia; and as having at the time of his murder, adopted a method of attack and defense which seems to have been common in those days, in that he attempted to tear out the eyes of his murderer.

Ophthalmia or blear-eyes (lippitudo) seems to have been common in imperial Rome. The Emperor Trajan, to whom his friend Sura was accused of conspiring against his life, manifested his confidence by going without a bodyguard to Sura's house, calling there for Sura's physician, and allowing the latter to apply an ointment to the imperial eyes.

Other classical trifles collected by Esser include references to the eyebrows, deep or prominent eyes, the use of cosmetics, the color of the eyes, strabismus, farsightedness, and unilateral blindness. *W. H. Crisp.*

THE THIRD ANNUAL MEETING OF THE ASSOCIATION FOR RESEARCH IN OPHTHALMOLOGY

The last three of the six papers on Light, read before the Association for Research in Ophthalmology in New Orleans in May, 1932, appear in this issue of the Journal. This session of the Association saw a slight difference in the material covered in the papers in that it was more truly the product of research and less that of clinical experience than was the case in the first two sessions. The organization is not sufficiently old to have more than begun to fulfill the intentions of its founders. More and more it will tend to stress

the idea of research but to accomplish this will require considerable time. The Association will survive or perish depending on whether it succeeds or fails in this because if it fails to be a truly research society and becomes just another clinical society there will be no place for it. There are already enough of these.

Considering the size of the attendance at the convention of the American Medical Association, the attendance at the Research Association meeting was very good, but perhaps equally important was the fact that the audience was interested and attentive though most of the papers were technical and of only indirect clinical application. Apparently the taste of research was well received. It was noticeable that not very many questions were asked. The commissioners in general took a holiday as far as quizzing the speakers was concerned as only a few of the papers elicited queries. The more technical the papers become the more true will this be, and just how valuable a feature this quizzing without discussion will prove is another thing that time will tell.

All of the papers were extremely interesting and some were very apparently the product of a great deal of laboratory work and were splendid examples of the type of study that should be considered by a research society.

To enter here into a discussion of them individually would occupy too much space but anyone will be well repaid for a careful reading of them.

Lawrence T. Post.

KERATOPLASTY

Probably in the back of the mind of every man who has entered the profession of ophthalmology has been the hope that he might contribute some new thought or discovery to his chosen specialty. What young man has not dreamt of restoring sight to the blind by substituting some transparent tissue for the leukomatous cornea. Some have actually tried it though most have never found the time to carry on the protracted preliminary experiments necessary for any such procedure. Whether the ophthalmologist has actually attempted such keratoplasty or not, he is keenly interested in the possibility of its successful accomplishment. For this reason the Journal has devoted considerable space in this and the preceding number to a study of experimental keratoplasty. The first part traced the history of such attempts by others and the second part is taken up with the author's own contributions.

Several points seem to stand out as essential to success. Through and through grafts are the most satisfactory and they must be taken from an animal of the same species. Another outstanding fact is that the technic is infinitely delicate and the best results can follow only after untiring practice and meticulous attention to details. In devising an instrument with which it is possible to cut out the desired sections cleanly and with a minimum of trauma, a very important step in the problem has been taken, for undoubtedly injury to tissue has been one of the biggest causes of failure in previous trials. Where trauma occurs, scars are bound to result and the last state is worse than the first.

The results with animals have been quite promising. Of course that does not mean that they will be equally as good when dealing with human eyes, especially since the eye in which it is hoped to make the implant is usually far from a healthy eye. On the other hand animals do not lend themselves readily to delicate ocular operations because of the impossibility of satisfactory after-care. The uncovered eye is liable to trauma of all sorts or to infection.

We hope that the author will have the opportunity to try out his method extensively in humans and that he may find the operation as successful on them as it proved on animals and that at a later date we can report these results to our readers. *Lawrence T. Post.*

REDUCTION IN SUBSCRIPTION RATE

Our readers will find a notation on the front cover of this issue that the

subscription price of the Journal is ten dollars yearly. This change was authorized by the directors, for new subscriptions and renewals on or after October first, 1932.

The explanation of this reduction in price is that the American Journal of Ophthalmology has always sought to present to the members of the ophthalmic profession the best in the literature of their specialty at as reasonable a charge as could be made. In line with this policy it has become possible, because of a reduction in printing costs and labor, to reduce the annual subscription rate, to those residing in the United States, to ten dollars.

Lawrence T. Post.

BOOK NOTICES

Travaux et Memoires de Clinique et Therapeutics Oculaire (Clinical Memoirs and Ophthalmic Therapeutics). By Dr. Charles Abadie. Paper covers, 408 pages, Editions Medicales N. Maloine, Paris, 1930.

Towards the close of an all day session of the Society of Ophthalmologists of Paris held in November last, at which an exacting program had somewhat wearied the attention of the large audience present a man arose to speak. His white hair and full beard proclaimed him as one of the old regime. His voice, penetrating to the farthest end of the hall and his clear forceful method of expression at once arrested the attention of the large gathering of his colleagues and this was maintained until he resumed his seat.

The speaker was Charles Abadie, the Dean of French Ophthalmology whose original contributions to ocular therapeutics have extended over half a century.

The volume of his Clinical Memoirs embodies the most important facts which he had developed during his long career, and it appears coincidently with the notice of his death. His aim through life, he tells us in a brief preface, had been always to seek new measures for the relief of his patients when the old ones seemed to be inadequate. His years, therefore, were voyages of discovery, and every apparently insoluble condition became a therapeutic adventure. The gathering together of the investigations which he made and the deductions that he drew from them as they appear in this little volume, are his final gifts to the profession which he loved.

It has probably been forgotten, if it was at all generally known, that Dr. Abadie introduced the intravenous use of drugs. This now daily procedure was bitterly opposed when first employed in 1897 and his insistence on its value required no little courage. Some of his critics considered it so dangerous a procedure that they urged that its use should not be permitted. He strongly advocated the long continued employment of the soluble mercurial salts in ocular syphilis in preference to the arsenicals that so often affect the optic nerve. His discussion on Basedow's disease is still of interest and especially in the consideration of the development of monocular proptosis occurring after thyroidectomy. His views regarding granular conjunctivitis presented in 1891 are many of them, still entertained today. His conclusion that trachoma was essentially a contagious disease produced by direct contact and that the infecting material must remain for an appreciable time in contact with the mucous surface and that vigorous local treatment is necessary for its cure is generally accepted today. He unqualifiedly approved of the intravenous injection of mercury in chorio-retinitis. This had been a valuable remedial measure in his hands. Perhaps his most important contribution was that on essential and progressive atrophy of the optic nerves, a condition so hopeless under ordinary measures of treatment. Arriving at the conclusion that atrophy of the optic nerve was dependent upon a contraction of the arteria centralis followed by a diminished nutrition of the nerve tissue and its consequent degeneration, he employed atropine by subcutaneous injection, two milligrams every two days, with marked improvement in the vision and enlargement of the visual fields.

His studies on the pathogenesis and treatment of certain other forms of atrophy of the optic nerve, were of great value. Although a skilled surgeon and impatient with those who permitted the increased intraocular tension to destroy sight for lack of operative interference he still maintained that our knowledge of glaucoma must be entirely revised, and that instillations in the eye could at best retard the progress of the malady but never wholly arrest it.

The style in which the work is written is simple and clear and it makes very delightful reading. To those who have been familiar with the keen analytical judgment of Dr. Abadie this little book will come as a gracious and welcome bequest. *Park Lewis.*

Arquivos do Instituto Penido Burnier (Archives of the Penido Burnier Institute), Campinas, Sao Paulo, Brazil, 1932, volume 1, number 1, March.

These Arquivos are intended to publish only the work of the titular and honorary members of the Institute, and to appear at irregular intervals. This first number contains 175 pages, with several illustrations including photographs of the founder and chief ophthalmic surgeon, Penido Burnier, as well as of the staff, and of the plans of the buildings. The Institute was founded June 1, 1920, and the medical association of the Institute was organized in January, 1927.

The following original articles are included: Postoperative neurology (Physiopathology of the gasserian ganglion), by E. Vampre, a forty-two page monograph on the ganglion; Trachoma in Brazil, its origin and diffusion, by Penido Burnier; Tuberculous sclerokeratitis, by Paulo Ariani; Dental examination and therapy in the light of ophthalmology, by Mascarenhas Neves; Intolerance to lumbar puncture and its pathogenesis, by Cortes de Barros and Pena Chaves; and Clinical study of general otogenous infection, by Gabriel Porto. There are also clinical notes on intentional dislocation of the eyeball, by A. de Almeida; and on prickle-cell epithelioma of the larynx, with total laryngectomy, by Gabriel Porto. The volume closes with the by-laws and reports of meetings of the Penido Burnier Medical Association.

J. B. Thomas.

Die Intrakapsulare Star Extraction (Intracapsular cataract extraction). By A. Elschnig, 26 illustrations. Julius Springer, Berlin, 1932.

This is the first monograph on the subject, and because it answers practically every question relative to intracapsular extraction, it will be greatly appreciated and frequently referred to by every ophthalmic surgeon. The description of the Knapp-Török-Elschnig technic, including the pre-operative preparation and postoperative management of normal and complicated cases is delightfully lucid, because of the precise description of every detail. The book contains also descriptions of Pagenstecher, Smith, Barraquer, Stanculeanu, and Knapp-Török technics, with the special indications for each method.

Ray K. Daily.

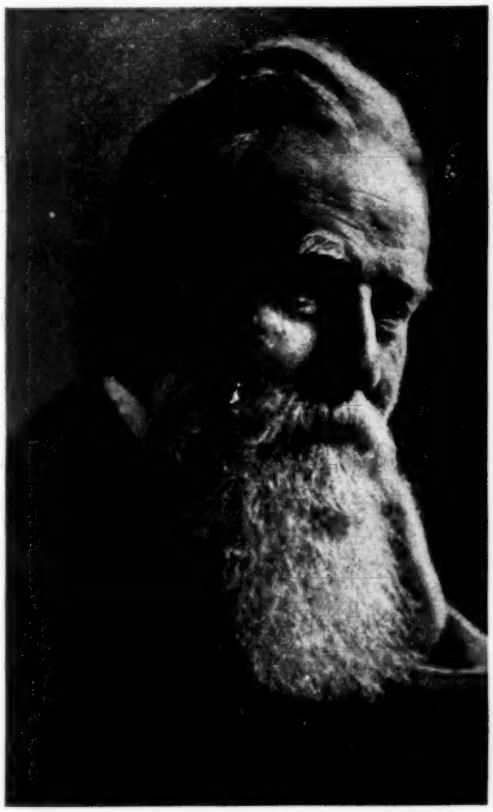
OBITUARY

Hermann Pagenstecher, Senior

(Passages selected from a memoir by Dr. Scheffels in the Klinische Monatsblätter für Augenheilkunde, 1932, volume 89, page 99.)

Hermann Pagenstecher, Senior, the renowned surgeon of Wiesbaden, Germany, died April 11, 1932, in his eighty-eighth year, and in the sixty-fifth year of his medical activity. Professor Pagenstecher was known far beyond the boundaries of his native land, and counted among his clientele, crowned heads of Europe. He was born in Langenschwalbach on September 16, 1844, studied in Wiesbaden and in the Universities of Würzburg, Berlin, and Prague. In 1868 he became assistant at the University eye clinic in Greifswald, and in 1869 took a similar position at the Wiesbaden eye clinic with his brother Alexander Pagenstecher.

He then spent two lengthy periods of study in London, where he was active at Moorfields Hospital, and devoted himself to the study of pathology. After the death of his brother Alexander he took over the leadership of two charitable eye institutions in Wiesbaden, where he became extraordinarily active in his specialty. He was the author of numerous papers on ophthalmology. His ambidextrous skill was remarkable. He was uniformly amiable and attentive to all his patients, high and low. His recreations were found in the study of nature and of art. He loved to visit the great picture galleries, and accumulated a comprehensive collection of paintings. *W. H. Crisp.*



HERMANN PAGENSTECHER (1844-1932)

ABSTRACT DEPARTMENT

EDITED BY DR. WILLIAM H. CRISP

Abstracts are classified under the divisions listed below, which broadly correspond to those formerly used in the Ophthalmic Year Book. It must be remembered that any given paper may belong to several divisions of ophthalmology, although here it is only mentioned in one. Not all of the headings will necessarily be found in any one issue of the Journal.

CLASSIFICATION

1. General methods of diagnosis
2. Therapeutics and operations
3. Physiologic optics, refraction, and color vision
4. Ocular movements
5. Conjunctiva
6. Cornea and sclera
7. Uveal tract, sympathetic disease, and aqueous humor
8. Glaucoma and ocular tension
9. Crystalline lens
10. Retina and vitreous
11. Optic nerve and toxic amblyopias
12. Visual tracts and centers
13. Eyeball and orbit
14. Eyelids and lacrimal apparatus
15. Tumors
16. Injuries
17. Systemic diseases and parasites
18. Hygiene, sociology, education, and history
19. Anatomy and embryology

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1. GENERAL METHODS OF DIAGNOSIS

Claiborn, L. N. **The ophthalmic test for sensitivity to horse serum.** Jour. Amer. Med. Assoc., 1932, v. 98, May 14, p. 1718.

For the ophthalmic test, the author instilled one drop of tetanus antitoxin into the conjunctival sac of one eye. The test was read after fifteen minutes, the remaining eye serving as a control. The positive reactions varied from slight injection of the conjunctival vessels to marked conjunctival reddening. When the test was markedly positive, the patient usually complained of some burning and itching of the eye. The positive ophthalmic reactions usually appeared in from ten to fifteen minutes and subsided entirely in from one-half to two hours. No untoward ophthalmic reactions occurred. Desensitization methods are described.

In 465 patients, both the ophthalmic and the intradermal test were employed; 5.6 percent were positive to both tests, and 21.3 percent were positive to the intradermal test only. All those who had positive ophthalmic tests also had positive intradermal tests. Undiluted tetanus antitoxin (horse serum) may be safely used for the ophthalmic test. It is less sensitive but of more value as a clinical index of susceptibility to serum reactions than the intradermal test. Four hundred and twenty-six patients received tetanus antitoxin; 204 were observed for at least ten days; twenty-four percent of the latter presented serum reactions. Desensitization did not appreciably alter the percentage of serum reactions. In patients who had previously received horse serum, a slightly higher percentage of accelerated serum reactions was observed. Delayed or ordinary serum reaction occurred in approximately the same percentage (from fourteen to eighteen) of patients with both tests positive, those with the ophthalmic test negative and the intradermal test positive, and those with both tests negative. (Five tables.)

George H. Stine.

Dufour, Marcel. **The field of the ophthalmoscope.** Ann. d'Ocul., 1932, v. 169, May, pp. 345-375.

This is presented as a mathematical study of the ophthalmoscope. The article does not lend itself to abstraction.

H. Rommel Hildreth.

Ferree, C. E., and Rand, G. **A convenient device for using artificial pupils of different sizes.** Amer. Jour. Ophth., 1932, v. 15, July, pp. 632-634.

Hardy, LeG. H. **Scotometry—history and technique; with a scotometric tangent screen and scales.** Trans. Amer. Ophth. Soc., 1931, v. 29, p. 486.

Hardy gives a very comprehensive review of this subject and presents a scotometric tangent screen and scales. The paper does not lend itself to abstraction. (Review of literature.)

C. Allen Dickey.

Kraupa, Ernst. **Arc-lamp ophthalmoscopy.** Klin. M. f. Augenh., 1932, v. 88, May, p. 665.

At the instance of Kraupa, Professor Henker constructed a simplified Gullstrand's ophthalmoscope with arc lamp, which gives a greater intensity of light and sharper images, is very valuable for finding fine opacities of the deeper parts of the vitreous, preretinal precipitates, minute differences of level, and so on, and allows even the inexperienced observer to discover details of the fundus in red-free light.

C. Zimmermann.

Krimsky, Emanuel. **Head-lamp for binocular loupe.** Amer. Jour. Ophth., 1932, v. 15, July, pp. 635-636.

Mendoza, R. **Clinical application of gonoscopy.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, June, p. 333.

Gonoscopy is valuable to determine whether miotics are effective in an individual case of glaucoma, to decide on type of operation, and to establish the diagnosis in doubtful cases. Complicated and expensive apparatus is however not essential. The author uses the ordinary ophthalmoscope and an object lens of more than twenty diopters. The patient is made to look in the direction of the sector of the angle to be explored, the object lens is held perpendicular to the plane of the iris for which it is focused and is decentered away from the plane of the iris to secure a prismatic effect, and the ophthalmoscopic mirror is held so that its reflected rays are parallel with the plane of the iris. To examine the lower angle the patient is either recumbent or else the examiner stands behind the patient. A plus lens in the ophthalmoscope may be used to magnify the image and a Berger binocular loupe with luminous source may be employed. Gonoscopy is generally easier in the young than in the old. (Illustrated.)

M. Davidson.

Reese, A. B. **A useful device for an ophthalmoscope.** Amer. Jour. Ophth., 1932, v. 15, April, p. 346.

Von der Heydt, Robert. **A photokeratoscope.** Amer. Jour. Ophth., 1932, v. 15, April, p. 346.

Wegner, W., and Roese, H. F. **A method of studying the living eye.** Klin. Woch., 1931, v. 10, Nov., p. 2133.

The authors review the methods of studying the living eye in the perfused dog (the circulation in the eye is retained by using defibrinated blood and a pump to maintain respiration) by the Russian authors Alexejeff, Russakow, and others, and by the Duke-Elders. This permits the study of ocular changes in the use of chemicals as well as the hormones of the internal secretions. The vascular trauma must be taken into consideration.

Beulah Cushman.

2. THERAPEUTICS AND OPERATIONS

Apin, Karl. **Observations on orbital anesthesia.** Klin. M. f. Augenh., 1932, v. 88, May, p. 651.

Apin discusses orbital injections for anesthesia, diminution of tension, and immobilization and propulsion of the eyeball. For reaching the ciliary ganglion, which lies 15 to 18 mm. behind the globe between the optic nerve and the external rectus muscle, the safest place of puncture is the inferior lateral quadrant. Two c.c. of two percent novocain solution is sufficient. A needle of 3.5 cm. inserted through the fornix will inject to such depth that all the recti muscles may be paralyzed.

C. Zimmermann.

Aulamo, Rauno. **X-ray therapy in ocular tuberculosis.** Acta Ophth., 1932, v. 10, pts. 1-2, p. 159.

The author uses this form of therapy in addition to the routine local and

constitutional treatment. Radiation is given once a month for from 6 to 8 treatments. Phlyctenular conjunctivitis and episcleritis are treated with soft superficial rays at short focus and with a 1-mm. aluminum filter. For scleritis and sclerokeratitis, medium soft rays of 38-cm. focus are used, with a 2-mm. aluminum filter. Uveitis and tuberculosis of the posterior segment are treated with penetrating rays at 38-cm. focus and with 0.5 mm. copper filter. Increased tension and incipient cataract contraindicate x-ray therapy. When properly administered it is harmless, and the author finds it particularly helpful in phlyctenular conditions and anterior uveitis.

Ray K. Daily.

Balacco, F. **Hemopoietic serotherapy in ocular hemorrhages.** Lettura Oft., 1931, Dec., p. 644.

Five cases were treated in the manner described by this investigator. In three cases, all accidentally produced, the hemorrhage was in the anterior chamber. One of these resulted from delirium occurring a few hours after uncomplicated cataract extraction. A fourth case was one of preretinal hemorrhage in a diabetic patient, and the fifth was one of anterior vitreous hemorrhage in a young patient with a family history of tuberculosis. This last patient had a strongly positive Pirquet test.

Horse serum of the second blood-letting was administered orally in these cases. Each patient received two vials daily. Absorption was prompt in all but the tuberculous case, although even here the response was so effective that no more than fourteen vials were necessary. This form of treatment is considered a specific in the various forms of intraocular hemorrhage but of particular importance in the most delicate operative cases. *F. M. Crage.*

Burdashaw, W. J. **Upper lid and superior cul-de-sac irrigator.** Jour. Med. Assoc. of Georgia, 1932, v. 21, June, p. 247.

The author describes and illustrates a hollow lid elevator through which the superior cul-de-sac may be irrigated. He recommends it for removal of foreign bodies, treatment of conjunctivitis, and irrigation before operations. The instrument is manufactured by Lentz and Sons, Philadelphia.

Ralph W. Danielson.

Holm, Ejler. **Experiments with the Gerson diet.** Acta Ophth., 1932, v. 10, pts. 1-2, p. 232.

This salt and sugar free diet with a high vitamin content was tried in fifteen patients with ocular tuberculosis. The results were negative, and the author concludes that the vogue of this diet is not justified on scientific grounds. *Ray K. Daily.*

Oláh, Emil. **Rational employment of eye drops and eye ointments.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 510-513.

Rabkin, E. B. **Postoperative care without bandages.** Arch. of Ophth., 1932, v. 7, June, pp. 901-903.

The use of bandages is not essential for favorable outcome following operative procedures and the postoperative period is frequently shortened when none is used. The author has seen no complications that could be attributed to use of the open method. Control and observation of the wound are easier. The method deserves more consideration by ophthalmologists.

M. H. Post.

Spaeth, E. B. **Some biological principles which underlie ophthalmic plastic surgery.** Amer. Jour. Ophth., 1932, v. 15, July, pp. 589-603.

Terson, A. **Percaine eye salve.** Ann. d'Ocul., 1932, v. 169, May, pp. 375-378.

This substance, a derivative of quinine, ten times more active as an anesthetic than cocaine, is furnished in ampoules and bottles in one and two percent strength. It is sterilized by heat, is stable, may be mixed with adrenalin, and is effective by direct application to a mucous membrane as well as by injection.

H. Rommel Hildreth.

Terson, A. **Removal of cysts of the brow and certain orbital cysts.** Ann. d'Ocul., 1932, v. 169, April, pp. 297-300.

A curved blunt instrument and one suggesting a large strabismus hook are described, and also their use in dissection for removal of such cysts. The hook aids in the freeing of the pedicle. A forceps with the teeth displaced to one side is presented for closing skin wounds, the advantage being that the field is not obscured.

H. Rommel Hildreth.

Thorne, F. H. **Enucleation snare.** Military Surg., 1932, v. 70, April, p. 379.

The author describes an instrument similar to the tonsil snare, used for severing the optic nerve in enucleation.

M. E. Marcove.

Wagner, J. **Dazet preparations in ophthalmology.** Klin. M. f. Augenh., 1932, v. 88, May, p. 647.

Wagner reports his bacteriological investigations on the action of these gold preparations on cultures of staphylococci, pneumococci, and gonococci, and on the eyes of rabbits infected with these germs. The preparations showed very good disinfecting power without irritation, so that they were also used on human eyes in thirty cases of conjunctivitis, ten of corneal ulcer, and fifteen of ciliary blepharitis. The best results were obtained in acute processes, where with regard to rapidity, depth, and extent of action these preparations seemed superior to the usual effective methods.

C. Zimmermann.

3. PHYSIOLOGIC OPTICS, REFRACTION AND COLOR VISION

Ames, A J., and Ogle, K. M. **Size and shape of ocular images: 3. Visual sensitivity to differences in the relative size of ocular images of the two eyes.** Arch. of Ophth., 1932, v. 7, June, pp. 904-924.

This is a mathematical elaboration of the problem stated in the subtitle, and does not lend itself to abstraction. The threshold of sensibility as to difference in size of images has been carefully studied by the authors, and it is suggested that on the one hand a difference in relative size of only 0.027 percent, or 3 parts in 10,000, may be discernible; and on the other hand that a difference of two or three times the threshold value for size discrimination may be sufficient to cause eyestrain.

M. H. Post.

Berens, C., and Stark, E. K. **Studies in ocular fatigue; 6, fatigue of accommodation, experimental and clinical observations.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 527-542; also Trans. Internat. Cong. of Ophth., 1929.

Birch-Hirschfeld. **Neodymglas.** Zeit. f. Augenh., 1932, v. 77, May, p. 161.

Neodymglas is a patented glass, faintly bluish violet in color. Spectroscopic examination shows the greatest absorption (fifty percent) for rays of 589 wave-length. Since yellow has the greatest specific luminosity, the glass reduces glare. All other colors appear nearly normal. The glass was introduced to increase the contrast of colors which are mixtures of yellow with green or red. This is of very real advantage to persons with inferior color sense, as is demonstrable by viewing Stilling and Wölfflin charts through this glass. *F. Herbert Haessler.*

Bothman, Louis. **Refraction changes in the eyes of children under six years of age.** Arch. of Ophth., 1932, v. 7, Feb., pp. 294-296.

The work reported in this paper was undertaken to refute the idea common among ophthalmologists that refractive changes in the eyes of children tend toward the production of myopia. Two hundred and forty-eight eyes were examined, of which seventy-one percent showed increased hyperopia in both meridians on a second determination of their refractive error under atropin, leading the author to feel that the likelihood is that up to six years of age hyperopia will increase rather than decrease. *M. H. Post.*

Carleton, E. H., and Madigan, L. F. **Size and shape of ocular images: 2.**

Clinical significance. Arch. of Ophth., 1932, v. 7, May, pp. 748-756.

As the title indicates, this paper deals with practical applications of the work reported under a similar title by Ames, Gliddon, and Ogle. The authors found that in low degrees a difference in the size of ocular images caused no discomfort, but five percent appeared to be the limit of size difference that could be tolerated. Discomfort was experienced by patients of all ages with either emmetropia or varying refractive disturbances. Symptoms were of a general or local type. By correction of the size difference, twenty percent of all cases obtained complete relief, sixty percent partial relief, and twenty percent no relief. The failure to obtain relief in some cases was undoubtedly due to asymmetric size difference, a type of case with which the present measures for relief are inadequate to deal. The field is only just opening, but gives promise of considerable development. *M. H. Post.*

Crisp, W. H. **The cross-cylinder tests, especially in relation to the astigmatic axis.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 729-738; also Oxford Ophth. Congress, 1931, in Trans. Ophth. Soc. United Kingdom, 1931.

Dupuy-Dutemps, L. **Contraction of the pupil is associated with convergence.** Bull. Soc. Franç. d'Opht., 1931, 44th year, pp. 358-365.

Contraction of the iris diaphragm attenuates lens aberration, increased during accommodation, and thus produces sharper retinal images. It contributes with accommodation and convergence to adaptation of the eyes for near vision. The problem whether iris contraction is directly related to accommodation, to convergence, or to both at once has for a long time been under discussion, but can only be resolved by observation of the pupil in cases where there is dissociation of accommodation and convergence in the absence of any peripheral muscular or nervous lesion. Since isolated paralysis of the function of convergence is a frequent symptom of epidemic encephalitis, such cases are not difficult to find. Observations made in the presence of complete paralysis of convergence but with normal accommodation and photomotor reflex have all shown complete lack of contraction of the pupil when accommodation was at its maximum. With incomplete paralysis and the amplitude of convergence simply reduced, pupillary contraction persisted but appeared diminished. In none of the many postencephalitic states observed has abolition of pupillary contraction been noted when the photomotor reflex and convergence were conserved. The author has never personally noted a case in which paralysis of accommodation has occurred without involvement of the iris musculature or of convergence. However, five such cases have recently been reported by Bollack, and in no case was there the least disturbance of iris function for either light or convergence.

Further observations in cases having simple functional anomalies have led to the same conclusion. In the high myope who converges without accommodating, contraction of the pupil is noted. In convergence insufficiency or in intermittent divergent strabismus the subject first converges correctly on the object fixed, and at the same time the pupils contract. Then convergence relaxes and the pupils dilate, even though there has been no change in the accommodation. The author cites a large number of observations made in other conditions and in normal subjects in whom dissociation of the movements for near vision obtained was by optical means. He concludes that these various observations definitely show contraction of the pupil in near vision to be closely associated with convergence and with convergence alone. *Phillips Thygeson.*

Ferree, C. E., and Rand, G. **Lighting without glare.** Arch. of Ophth., 1932, v. 8, July, pp. 31-38.

In this paper the authors describe electrical ceiling fixtures that provide means for illuminating the ceiling and work with light giving a comfortable

distribution of brilliance in the field of view. This object is obtained by combining direct and indirect lighting in such a way as to shade the eye from glare from that part of the fixture which directs light to the working plane, such baffles being interposed in the latter beam as to produce diffused illumination. *M. H. Post.*

Ferree, C. E., Rand, G., and Hardy, C. **Refractive asymmetry in the temporal and nasal halves of the visual field.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 513-522.

Greene, E. B. **Two circle grid charts for measuring visual acuity and astigmatism.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 716-720.

Holmström, M. **Contact glasses in keratoconus and irregular astigmatism.** Acta Ophth., 1932, v. 19, pts. 1-2, p. 197.

The author reports three patients with keratoconus, and one with irregular astigmatism, who were able to continue in their occupations by means of contact glasses. They were provided with the blown glasses which are made individually for each patient by Müller of Wiesbaden. These lenses are slightly inferior optically to the Zeiss ground glasses, but are less irritating to the eyeball because they are held in the fornices and not by capillary suction (as are the Zeiss glasses); and because being made to fit each individual eye they conform better to the shape of the eyeball. *Ray K. Daily.*

Jackson, Edward. **Norms of refraction.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 174-190. (See Amer. Jour. Ophth., 1932, v. 15; April, p. 371.)

Jacobs, Milton. **The Brown duochrome refraction test.** Amer. Jour. Ophth., 1932, v. 15, April, pp. 313-319.

Lafon, C. **Optometric chart.** Ann. d'Ocul., 1932, v. 169, June, pp. 475-478.

For small children and illiterates who have a slight knowledge of the alphabet this chart has been prepared. The letters are printed in lower case type. *H. Rommel Hildreth.*

Lancaster, W. B. **The ophthalmologist and the lighting problems of his patients.** Arch. of Ophth., 1932, v. 8, July, pp. 1-8.

Light which superficially appears good may nevertheless be the cause of symptoms which persist after ordinary treatment. The most common fault is to have brilliant illumination concentrated on the reading or other working material, while the rest of the room is in comparative darkness. The light should be diffuse, soft, and free from sharp shadows and sharp contrasts. The amount of light is dependent not upon the intensity of the source but upon the amount reflected from the work, and should vary with the type of work. Thus, for reading ten foot-candles is sufficient, while for sewing on dark cloth this illumination may be increased several hundred fold. With indirect illumination, ten foot-candles results from about one watt per square foot in a room with light ceiling and walls. It is obvious that light which is sufficient for strong, healthy eyes may be insufficient or more than sufficient for inflamed, irritated, or strained eyes. *M. H. Post.*

Luedde, W. H. **The mechanism of accommodation: facts and fancies.** Arch. of Ophth., 1932, v. 7, Jan., pp. 40-70; also Sec. on Ophth., Amer. Med. Assoc., 1931.

To assume that any elastic tissue can be maintained in a state of deformity while at rest is contrary to all the laws of physiology, and theories of accommodation based on such an idea are at variance with all known principles. Hence the theory of Helmholtz is inconsistent with the known facts. We are confronted with the necessity of seeking a mechanism extrinsic to the lens. Luedde, in accordance with Tscherning and other writers, is of the opinion that such external forces are applied by the vitreous and the zonular fibers. The paper contains many ref-

erences to the literature and the opinions of writers on both sides of the question. *M. H. Post.*

Luedde, W. H. **Monocular cycloplegia for the control of myopia.** Amer. Jour. Ophth., 1932, v. 15, July, pp. 603-610.

Måhlén, Sven. **Corrections for refractive errors applied on gas masks.** Det oftalmologiske Selskab i København's Forhandlinger, 1931, p. 23. In Hospitalstidende, 1932, May 19.

It is suggested that the lenses be placed in special holders in front of the windows of the mask, so that they may be at right angles to the line of vision. Decentering may be necessary. A myope can wear a correction, provided that the distance from the cornea to the lens does not exceed 20 mm. An increase of —0.25 to —0.50 D. in the strength of the glass may be necessary. In hyperopia, the strength of the sphere should be diminished: if astigmatism is present, a corresponding reduction of the cylindrical correction should also be made. With these masks it was found that the results at rifle practice were as good as when ordinary glasses without the masks were used. *D. L. Tilderquist.*

Meyer, M. F. **Mechanism of accommodation studied experimentally.** Arch. of Ophth., 1932, v. 8, July, pp. 53-65.

The author of this paper lays down the principle that "an unsymmetric convex lens of flexible material, when held in a frame and brought by one-sided hydraulic pressure nearer to symmetry, draws its effective focal plane closer". This fact is then applied to suggest an interesting theory of accommodation. Contraction of the radial fibers of the ciliary muscle draws forward the choroid, while the posterior choroidal vessels become engorged, preventing the formation of a vacuum; the vitreous is thus pressed forward against the lens, forcing it forward in turn. The anterior pull of the ciliary muscle at the same time is exerted through the iris on to the periphery of the lens, thereby allowing only the central portion of the lens to protrude into the anterior chamber. The aqueous is forced back through the pectinate regions and there absorbed by the ciliary processes. *M. H. Post.*

Ovio, G. **Incoordination of the two eyes in reading.** Rassegna Ital. d'Ottal., 1932, v. 1, nos. 1-2, pp. 14-25.

In reading, the gaze is carried to the extremity of the lines and each eye is at a different distance from the fixation point. This difference may be as great as 30 mm., producing an optical difference of about 0.3 diopter. This optical difference, at the extreme distance of reading, would bring about a visual diminution of a little more than one-tenth. But ordinarily the reading distance is about one-third of the maximum distance and therefore the optical difference which one encounters is practically negligible. This is an example of one of the many so-called optical defects of the eyes which represents one of the steps by which the organ has risen in its evolution toward perfection. (Many mathematical formulæ and diagrams.)

Eugene M. Blake.

Pascal, J. I. **The photoscope in retinoscopy.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 711-716.

Pascal, J. I. **Simple method for calculating dioptric power.** Arch. of Ophth., 1932, v. 8, July, pp. 50-52.

The author's "method" is based upon a unit of curvature similar to the diopter unit, the term "metrec" being recommended for this unit.

M. H. Post.

Peter, L. C. **Amblyopia ex anopsia in adult life.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 493-497.

Pflugk. **The doctrine of accommodation in the light of recent researches.** Klin. M. f. Augenh., 1932, v. 88, June, p. 721.

Accommodative relaxation of the zonule has not yet been observed in fully accommodating eyes. Since the zonule is considerably more flexible

than the capsule of the lens the shape of the lens cannot be changed merely by traction of the zonular fibers. The radius of lenticular curvature at the anterior pole after removal of cornea and lens is from 13 to 14 mm., while the radius of the lens after separating its connection with zonule and vitreous is not less than 8 mm., so that the accommodated lens with radius of from 5 to 6 mm. (Helmholtz, Gullstrand, Tscherning) cannot be interpreted as "approaching the shape of rest". It is necessary to assume the action of an external force which elicits accommodative decrease of the radii of the lens. In the absence of any other firm connection of the lens with its surroundings, this force can only be the pressure of the vitreous.

C. Zimmermann.

Poser, Max. **Various types of ophthalmic lens corrections.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 709-711.

Prangen, A. de H. **Subnormal accommodation.** Trans. Amer. Ophth. Soc., 1931, v. 29, pp. 372-390. (See Amer. Jour. Ophth., 1932, April, v. 15, p. 373.)

Sheppard, W. B. **A layman considers migraine.** Annals of Internal Med., 1932. v. 5, June, p. 1532.

This is a well arranged paper by an educated layman who has had migraine for about fifty years and who has spent an unusual amount of time reading the literature on the subject. He advocates a quiet life, moderate exercise, much sleep, and great attention to elimination. The use of cannabis indica and calomel is recommended.

Ralph W. Danielson.

Svensson, Gösta. **Corneal refraction, corneal radius, depth of anterior chamber, and light sense in myopia.** Det oft. Selskab i København's Forhandlinger, 1931, p. 23. In Hospitalstidende, 1932, May 19.

The corneal refraction, the corneal radius, and the depth of the anterior chamber were determined in 603 myopic eyes of from —0.50 to —20. D. myopia, of all ages. Marked individual variations were found, but there was nothing to indicate that these optical constants varied any differently in myopic than in nonmyopic eyes. As to the light sense, the minimum percentage was determined with Gullstrand's photoptometer and the power of discrimination with the Møller-Edmunds scotopticometer. In six hundred twenty-seven nonmyopic eyes, there was found an increase of the minimum percentage in the light sense and a reduction of the power of discrimination with increase in age, beginning at thirty-five to forty years. In myopia there was an exactly analogous condition. In myopes, also, there occurred an increase of the minimum percentage in the light sense and a decrease of the power of discrimination with the increase of myopia. *D. L. Tilderquist.*

Vita, A. **Concerning the prismatic effect of decentering of meniscus lenses.** Rassegna Ital. d'Ottal., 1932. v. 1, nos. 1-2, pp. 76-95.

In this rather lengthy article Vita works out the formulæ for determining the prismatic effect of decentering various types of lens. A large number of curves are plotted and the subject is fully and clearly treated. The prismatic effect of decentering a spectacle lens, expressed in prism diopters, is equal to the product of decentration by the dioptric power. However, by reason of the spherical aberration, the visual line of the eye, in the primary position, meets the decentered lens at a point where the power is slightly greater than that of the axis. For this reason, the prismatic effect of decentration is greater in the case of meniscus lenses (because of greater spherical aberration) than in flat lenses. The effect for every kind of lens is explained by diagrams.

Eugene M. Blake.

Wells, D. W. **Controlled reading.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 508-509.

Wostry, Milos. **Cataract in myopia.** Oft. Sbornik, 1931, v. 6, pp. 161-169. (See Section 9, Crystalline lens.)

4. OCULAR MOVEMENTS

Abraham, S. V. **Myasthenia gravis: new diagnostic eye findings, with possible pathologic significance.** Arch. of Ophth., 1932, v. 7, May, pp. 700-719.

By the author's method of study, sursumduction of the eye is determined by rotating a Risley prism alternately base up and base down until diplopia is produced and recording the point of doubling. During this procedure, as well as at the beginning, the Maddox rod can be slipped before either eye and the amount of hyperphoria measured by the amount of prism necessary to make the line and light coincide. From these tests, the action of the vertical rotators and their fatigue may be determined. The interposition of the Maddox rod under such circumstances in the normal eye gives results which show that the muscles immediately relax almost entirely on suspension of fusion. In a patient suffering with myasthenia gravis, however, such is not the case. Eight cases are reported in detail, illustrating these points. Various investigations of myasthenic muscles indicate that their peculiar action is due to vasodilatation, possibly the result of disturbance of the vegetative nervous system, a theory that falls in line with the author's belief that the disturbance lies rather in failure of relaxation than in failure of contraction of the muscles. This theory is supported by irregularity in the amount and quality of heterophoria, by irregularity in duction readings and their unusual height, and by close proximity of images when diplopia is produced, while approximation of the amount of prism used to create diplopia and the hyperphoria measured by the Maddox rod test indicates that the muscles do not tire after considerable prolongation of these tests. Finally, the author concludes that myasthenia gravis is not a true myasthenia.

M. H. Post.

Bhaduri, B. **Congenital hereditary nystagmus.** Calcutta Med. Jour., 1932, v. 26, Feb., p. 311.

After briefly reviewing the literature, the author cites the case of a nineteen-year-old boy who had bilateral horizontal nystagmus. Both parents have normal eyes, but four younger brothers are similarly affected. One older brother and one younger sister are normal. The maternal grandfather also had nystagmus. In this pedigree, the condition is transmitted through the immune female, only the males being affected.

M. E. Marcove.

Dupuy-Dutemps, L. **Variations of the angle of convergence according to obliquity of gaze.** Ann. d'Ocul., 1932, v. 169, May, pp. 337-341.

Convergence is maximal with the gaze directed forward and diminishes as the direction of gaze becomes oblique. If the eyes could be turned ninety degrees to the side there would be no convergence. The paper is a mathematical presentation.

H. Rommel Hildreth.

Forsberg, C. W. **Hereditary ptosis.** The Journal-Lancet, 1932, v. 52, June 15, p. 378.

Forsberg presents a family tree of sixty-seven individuals in five generations in which twelve cases of hereditary ptosis have appeared. There was no sex linkage and no sex predilection. None of the original five ancestors was affected. The cases have appeared at the ages of six to twenty-two years, most of them at about twenty years of age. Some of the members of this tree are still children, so more cases will probably develop. Brief notes are given on the twelve cases. (One family tree chart, three photographs, and a bibliography.) *Ralph W. Danielson.*

Hildreth, H. R. **Maddox cheiroscope.** Amer. Jour. Ophth., 1932, v. 15, May, pp. 436-437.

Lombardo, M. **A single scleromuscular suture in Jameson's recession for squint.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 523-524.

Marlow, F. W. **The technique of the prolonged occlusion test.** Amer. Jour. Ophth., 1932, v. 15, April, pp. 320-323.

Stanojevic, L. **Nystagmus in the course of tabes dorsalis.** Klin. M. f. Augenh., 1932, v. 88, June, p. 793.

A man aged forty-seven years, affected with typical tabes dorsalis, presented the rare complication of nystagmus. In looking to the right, coarse nystagmus of horizontal rotary character set in, and in looking to the left, vertical nystagmus, increasing on looking down. The nystagmus was not congenital, and multiple sclerosis could be excluded. The patient also suffered from vertigo. *C. Zimmermann.*

Taylor, L. A. **Results of monocular occlusion of each eye in testing for hyperphoria.** Jour. Iowa State Med. Soc., 1932, v. 22, June, p. 267.

Taylor discusses his results in considerable detail, and makes the suggestion that if one cannot uncover some hyperphoria by covering the nonfixing eye one should try covering the fixing eye. *Ralph W. Danielson.*

Vestergaard, J. D. E. **Strabismus with Bielschowsky's phenomenon.** Det oftalmologiske Selskab i Københavns Forhandlinger, 1931, pp. 13-17. In Hospitalstidende, 1932, Feb. 11 and May 19.

A girl, eleven years of age, showing the group of symptoms first described by Bielschowsky in 1911 was presented. The symptoms are those typical of an ordinary paralysis of the superior oblique muscle and in addition increased rotation of the eyeball upward. If the left eye is involved, there is an upward squint of the left eye when the patient looks to the right, due to faulty action of the left superior oblique. The power of upward rotation of a normal eye is from 50° to 60°: in the case shown it was 70°. Bielschowsky assumes that this hyperfunction of the elevators results from a defect of the check ligaments associated with the superior oblique. The condition is practically always congenital. When there is diplopia which is relieved by a misplaced position of the head, improvement may sometimes be obtained by surgery, such as tenotomy of the inferior oblique of one eye and advancement of the superior rectus of the other eye. *D. L. Tilderquist.*

White, J. W. **Hyperphoria: diagnosis and treatment.** Arch. of Ophth., 1932, v. 7, May, pp. 739-747.

Hyperphoria, as a rule, is due to a paretic elevator or depressor. Tests should be carried out in the six cardinal directions for both distance and near. In the opinion of the author the best tests for the corners are the screen and parallax tests, the results being measured by prisms. Before resorting to operation, an accurate diagnosis should be made, the etiology determined, and systemic or local treatment instituted. Operations are contraindicated where the nature or amount of the lesion is changing for any reason, or when the false image is so far removed from the true as to be easily subject to suppression. Finally, when operation is decided upon, it must be definitely determined whether to resect the paretic muscle, or to tenotomize the associate antagonist or the direct antagonist. *M. H. Post.*

Wolfe, Otis. **Notes on muscle and fusion training and orthoptic treatment of motor anomalies.** Amer. Jour. Ophth., 1932, v. 15, July, pp. 618-626.

5. CONJUNCTIVA

Bourbon, O. P. **Notes on angular conjunctivitis.** Amer. Jour. Ophth., 1932, v. 15, June, p. 546.

Dovbush, R. D. **On the etiologic rôle of the meibomian glands in diseases of the conjunctiva and cornea.** Sovietskii Vestnik Opht., 1932, v. 1, no. 5, p. 206.

The author reports cases of obstinate conjunctival and corneal lesions which were greatly benefited by repeated massage of the eyelids, with subsequent application of ether to the intermarginal space. He assumes that in these cases dysfunction of the meibomian glands was of some etiologic significance. *M. Beigelman.*

Endelman, L. **Abortive forms of vernal catarrh.** Zeit. f. Augenh., 1932, v. 77, May, p. 219.

The author observed a conjunctival disorder characterized by itching and pallor, with a bluish milky color of the conjunctiva and a minimal amount of stringy exudate. He saw thirteen patients, mostly children during July and August. In no case was he able to examine the secretion microscopically. The clinical appearance, the occurrence during warm weather, and the cessation in cool periods suggested to him that his patients suffered from an abortive form of vernal catarrh. The most effective therapy was dilute vinegar to which adrenalin had been added.

F. Herbert Haessler.

Fassilova, M. **Diagnostic significance of the smear in trachoma.** Oft. Sbornik, 1931, v. 6, pp. 220-231.

Smears from the tarsal conjunctiva in 148 cases of trachoma and 51 cases of folliculosis proved an important factor in differential diagnosis. In trachoma the pleomorphism of the cells stands in direct relationship to the chronicity of the clinical condition. The epithelial cells are of varying sizes and polynuclear. The cells may be enlarged from two to three times and the form is rather round than oval; they stain irregularly and not so deeply as in benign conditions. The cells do not lie in heaps, but are strewn about, isolated. Between them one finds polynuclear leucocytes, small and large lymphocytes, isolated eosinophiles, débris of disintegrated cells, and strings of mucus. In the smear from normal conjunctiva or from a benign process, the nuclei of epithelial cells preserve a uniform character. They are oval and of the same size and color and lie close together in groups. The same uniformity was observed in some clinically healed cases of trachoma, from which one may conclude that the pleomorphism of cells is indicative of the course of the disease. The author considers Prowazek bodies as diagnostically decisive. She found them in forty-eight out of ninety-two fresh cases, and in fifteen out of fifty-six old cases. In the old cases, the color of the individual grains of the Prowazek bodies was red, showing greater affinity to acid components of the Giemsa stain. Examination with the slitlamp is important in early diagnosis of pannus. In follicular conjunctivitis it was always negative. *G. D. Theobald.*

Favaloro, G. **An attenuated and little known form of cicatricial trachoma.** Ann. di Ottal., 1932, v. 60, Jan., p. 3.

From time to time in the clinic, cases were met in which the conjunctiva presented a grayish-white appearance without the characteristic elevations of trachoma, so that it was doubtful whether they were pathological or were of normal conjunctival tissue. In some of these cases a typical cicatricial trachoma was present in the fellow eye. When the slitlamp and corneal microscope were systemically employed, a beautiful and regular design on the palpebral conjunctiva was demonstrated. Reticulated cicatricial tissues having a fibrous appearance circumscribed optically empty spaces. These were not alike in all cases but varied in extent and size of the trabeculæ. The author considers this to be a true trachoma in an attenuated form, such as is found in syphilis and in tuberculosis. The distinctive features do not appear under ordinary methods of examination, and the value of biomicroscopy is emphasized in this atypical form of trachoma. *Park Lewis.*

Favaloro, G. **Bacteriological and experimental researches in trachoma, with particular consideration to the Bacterium granulosis (Noguchi).** Rassegna Ital. d'Ottal., 1932. v. 1, nos. 1-2, pp. 26-65.

Favaloro carefully reviews the latest reports of work upon the etiology of trachoma, the finding of Bacterium granulosis in the conjunctiva, its cultural peculiarities, and experiments upon man and animals. He draws the following conclusions: (1) Bacterium granulosis of Noguchi is probably a new bacterial species, polymorphous, and usually, but not always, found in the human trachomatous conjunctiva. (2) Its inoculation in anthropoid apes very often produces a follicular conjunctivitis which is more or less typi-

cal. It is, therefore the pathogenic agent of a form of follicular conjunctivitis in apes. (3) Its inoculation into the normal human conjunctiva receptive to trachoma produces neither trachomatous manifestations, nor follicular or simple inflammatory reactions. In other words it is a saprophyte in the human conjunctiva. (4) Its inoculation in man confers a certain immunity in respect to reinfection with the same germ on account of the reaction of the palpebral tissues. It does not seem to confer immunity to material taken from a known trachomatous case.

The author concludes that, in all probability, Bacterium granulosis is not the specific agent of true trachoma in man, but a saprophyte of the human conjunctiva and the cause of a form of follicular conjunctivitis in apes.

Eugene M. Blake.

Feigenbaum, Aryeh, **Another case of supernumerary caruncle.** Klin. M. f. Augenh., 1932, v. 88, May, p. 662. (Ill.)

Supplementing his former article (see American Journal of Ophthalmology, 1931, volume 15, page 479), Feigenbaum reports another case. Separated by a strip of conjunctiva, 1 mm. wide, from the slightly enlarged right caruncle, a conical excrescence of 3 mm. diameter arose from the conjunctiva of the lower lid of a woman aged twenty-five years, 2 mm. from the lower inner border, its apex lying on the conjunctiva and extending to the border. It looked exactly like the caruncle, and under the corneal microscope showed a lobular structure, white excretory ducts of sebaceous glands, and very thin lanugo. *C. Zimmermann.*

Gallenga, C. **The elastic tissue of the tarsus in general argyrosis.** Rassegna Ital. d'Ottal., 1932, v. 1, nos. 1-2, pp. 5-13.

The author describes briefly the elastic network of the tarsus in generalized argyrosis and points out the relationship of this layer to the elastic tissue or tunica propria of the conjunctiva and that in front of the tarsus. He demonstrates that in this manner there is present a continuous whole made up of connections between the true skin, that of the lid margins, the tarsus, and the tunica propria of the conjunctiva. This anatomical disposition explains how chronic inflammations of the conjunctiva spread upon the tarsus, the elastic tissue submitting easily to progressive changes and to atrophy, and contributing to bring about the deformity of the lid, especially manifest in trachoma.

Eugene M. Blake.

Granström, K. O. **Oculoglandular tularemia.** Acta Ophth., 1932, v. 10, pts. 1-2, p. 237.

The author reports a case which clinically presented a typical Parinaud's syndrome, and was caused by contact with a rabbit. It was confirmed by the agglutination test.

Ray K. Daily.

Howard, H. J. **The rationale of treatment in some acute conjunctival infections.** Jour. Missouri State Med. Assoc., 1932, v. 29, May, p. 193.

In acute infections of the conjunctiva, the local treatment is apt to be too severe and continued too long. The majority of acute infections are due either to the pneumococcus or to the Koch-Weeks bacillus. For both organisms the incubation period is about twenty-four hours. For a period of two days, epithelial cell scrapings and smears show the presence of the invading organism in great numbers, but specimens taken on the fourth day or later usually show no evidence of the primary invaders. Yet disappearance of the bacteria is not associated with improvement in the symptoms of the affected eye. This is due partly to continued outpouring of exudate through the multitudinous tiny breaks in the mucous membrane, and partly to activity of the repair process. In gonococcus infections of the conjunctiva the bacteria do not disappear suddenly on the fourth day, but may be found for several weeks unless a foreign protein is given in sufficient dosage to induce a high temperature.

The author regards normal saline or boric acid irrigations as more efficacious than even mild antiseptic solutions. The presence of bacteria in scrapings and smears does not necessarily establish the diagnosis unless the organisms are found on epithelial cells in stained specimens. *M. E. Marcove.*

Kinsey, H. I. **Phlyctenular conjunctivitis in relation to tuberculosis in children.** Canadian Med. Assoc. Jour., 1932, v. 26, March, p. 298.

Beside reviewing the literature, the author reports on one hundred and thirty-six cases that were referred to the chest clinic at the Hospital for Sick Children in Toronto. Examination of the chest, physical and x-ray, revealed the presence of mediastinal tuberculosis in 75 of this group, pulmonary tuberculosis in 4, and negative chest findings in 29. The intracutaneous tuberculin test, using 1/20 of a milligram of old tuberculin, was positive in 98 cases, and negative in 33. The author was unable to establish any definite relationship between the presence of tuberculosis and the presence of phlyctenular conjunctivitis.

Kinsey does not believe the tonsils are a factor. There were very few cases in July, August, and September. Seventy-five percent came from poor homes. As regards treatment, the clinic is still continuing injections of tuberculin. In the earlier years bacillary emulsion was the tuberculin of choice, but recurrences of phlyctenules were more frequent than in the three or four years since antigen methylique was introduced, this tuberculin causing very little reaction. Needless to say, open air and improved nutrition are stressed, and in the author's opinion these are essential factors. (Six case reports and references.) *Ralph W. Danielson.*

Kreiker, A. **The results of heterotopic transplantation.** Graefe's Arch., 1932, v. 128, p. 336.

A transplant to the eye from the mucous membrane of the mouth gradually becomes destroyed over a period of many years, from a chronic inflammatory process. The precise causes for this destruction cannot be definitely established. Dissimilar anatomical and physiological structure of the oral mucous membrane, making organic fusion impossible, probably plays the greatest part. *H. D. Lamb.*

Kruglov, A. N., and Liorber, G. S. **The use of radium in the treatment of trachoma.** Sovietskii Vestnik Opht., 1932, v. 1, no. 5, p. 196.

In thirteen cases of stage 1 trachoma, and twelve cases of stage 2, the following technique of radium therapy was used. Four capillary tubes containing 8 mg. of the element, and supplied with copper filters 0.1 to 1.0 mm. thick, were placed upon the eyelids for periods of from one to four hours, with intervals of from one to five weeks between treatments. Six cases did not respond to the treatment at all, but in nineteen cases various degrees of improvement were noticed. In favorable instances the follicles as well as the more diffuse infiltration seemed to undergo rapid absorption. In cases of trachoma complicated by corneal pannus, radium appeared to do harm rather than good. In comparing x-ray therapy and the use of radium the authors give preference to the latter. It has a better effect upon the deep infiltrations, it is manipulated with greater convenience, and it is less likely to affect the cornea.

M. Beigelman.

Lasky, M. A. **The etiology of phlyctenulosis.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 725-728.

Olitsky, P. K., Knutti, R. E., and Tyler, J. R. **Corneal reactions to Bacterium granulosis and other microorganisms.** Jour. Exper. Med., 1932, v. 55, May, p. 803.

The authors sought to determine the type and degree of stimulus necessary to produce in animals the delicate vascularized corneal opacity characteristic of trachomatous pannus. They injected deep into the cornea a suspension of bacteria obtained by culture. Bacterium granulosis, as well as numerous other organisms, were used for this purpose,

mostly derived from the conjunctival sac of man or monkey.

Four of the twenty-five rabbits inoculated with a Tunisan culture of Bacterium granulosis failed to develop corneal lesions. With one exception, the remaining twenty-one animals reacted uniformly. For the first three days, there are signs of acute inflammation, with both ciliary and conjunctival injection, which usually subside by the sixth day. From the seventh to the fifteenth day, vascularization of the cornea begins and progresses actively. After five or six weeks, the eye is quiet except for the localized pannus. This was present for at least six months. The results obtained after inoculation of rabbits with several varieties of bacteria show a wide diversity of results. Some failed to produce any specific reaction. Others produced destructive, suppurative lesions of the cornea. The results obtained in monkeys were practically the same as those in rabbits. (Three plates.) *M. E. Marcove.*

Pascheff, C. **Researches on the follicular diseases of the conjunctiva.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 690-708.

Pillat, A. **Pathologic-anatomic findings in pigmentation of the conjunctiva of adults as the result of vitamin A deficiency.** Graefe's Arch., 1932, v. 128, p. 201.

In adults subjected for a long time to deficiency of vitamin A, there occurs a clinically visible neoformation of pigment in all parts of the conjunctiva, first in the epithelium and second in the subepithelial connective tissue. It is important to distinguish this pigment from the large amount of physiologically occurring pigment in the conjunctiva of the Chinese. The chief points of differentiation are: (1) the presence of dentritic cells or cells with enormous processes occurring in large numbers in the deep layers of the epithelium, such cells never being present in the normal conjunctiva of adults; (2) the presence of numerous droplet-like formations which are probably pigment in the process of formation or a preliminary stage of pigment. In avitaminosis the increase of pigment in the epithelium occurs in two different ways, first within the cells having pigmented processes, and second by increase of the normally large amount of pigment in the Chinese within the conjunctival epithelial cells, where it surrounds the nucleus.

The most intensive new-formation of pigment by the conjunctiva can be observed histologically in the fornix and the associated palpebral conjunctiva of the lower eyelid. It is less pronounced in the conjunctiva of the lid and fornix of the upper eyelid, still less in the bulbar conjunctiva, and least in the plica semilunaris. *H. D. Lamb.*

Rieger, Herwigh. **The etiology of conjunctival folliculosis.** Graefe's Arch., 1932, v. 128, p. 312.

The author gives a comparative table of the types of granulosis organisms, as reported by Noguchi, Finnoff and Thygeson, Tilden and Tyler, Lumbroso, and Bietti, and as found by the author himself. The material was obtained from four young people with follicular conjunctivitis. Follicles were excised with de Wecker scissors, and spread on the surface of the culture media. From each of two of these patients was cultured an organism which morphologically, culturally, and biochemically corresponded in a considerable degree to Bacterium granulosis Noguchi. Subconjunctival injection of a suspension of these organisms in three macacus rhesus monkeys produced in the conjunctiva of one animal histologic changes corresponding to folliculosis. The name Bacterium folliculosis is proposed by the author.
H. D. Lamb.

Sabata, J. **Two cases of pseudomembranous conjunctivitis.** Oft. Sbornik, 1931, v. 6, pp. 261-264.

Two cases of pseudomembranous conjunctivitis with corneal complications were observed, very similar to each other. In one of them, just at the time of the attack, a piece of oak bark was found in the conjunctival sac. No microorganisms were found.
G. D. Theobald.

Stastnik, Emanuel. **Further experimentation with copper thiosulphate in the treatment of trachoma.** Oft. Sbornik, 1931, v. 6, pp. 258-260.

In 1928, the author reported the use of copper thiosulphate intravenously in the treatment of trachoma, with excellent results. He has been experimenting with increasing doses. He began with 0.02 gm. copper sulphate to 2 gm. sodium thiosulphate, and has increased to 0.2 gm. copper sulphate to 2 gm. sodium thiosulphate, as often as daily in urgent cases. Usually, the dose is repeated every fifth day. Urinalysis should be done before each injection, the temperature taken, and the patient watched. The results observed were as follows: (1) Subjective symptoms such as tension, cutting pain, and photophobia disappeared after the first or second injection. (2) The conjunctiva grew pale, the anti-inflammatory influence was apparent, but the hypertrophy disappeared slowly. (3) Pseudoptosis, caused by inflammatory infiltration of Müllers muscle, soon disappeared. (4) Absorption of granules was minimal. (5) Pannus disappeared. If it is a very dense pannus, the largest vessels may be treated surgically, or with electrocautery. (This is, however, not necessary.) (6) Corneal infiltrates are easily absorbed and ulcers rapidly heal. The author has used copper thiosulphate for subconjunctival injection, but as yet has no report to make. He has had no untoward results.

G. D. Theobald.

Terson, A. **Improved mechanical treatment of trachoma.** Rev. Internat. du Trachôme, 1932, v. 9, April, pp. 83-94; also Ann. d'Ocul., 1932, v. 169, April, pp. 285-296.

Terson describes his treatment of trachoma in detail. In acute trachoma, with secretion and few granulations, he uses topical applications such as 1 percent silver nitrate, argyrol, mercury bichloride (1-500 to 1-1000), salicylarsenate of mercury three percent, copper ointments, Chaulmoogra oil, ichthyol, and one percent ectogan ointment, with frequent alternations. In trachoma having marked granulations he uses mechanotherapy, combining scarification with expression, with instruments of his own design. When heavily infiltrated folds or vegetations occur he excises them. In particularly resistant cases he resorts to grattage, curettage, massage with powdered boric acid, and occasional subconjunctival injections. He believes that partial excision of a gelatinized cul-de-sac is at times justifiable and that the thermopuncture of Abadie will occasionally give good results. Tarsal cauterization, however, has always been unsuccessful and has led to corneal complications. For fleshy pannus, powdered jequirity has given good results.

Phillips Thygeson.

Thygeson, Phillips. **Experimental granular conjunctivitis in monkeys, induced by Bacterium granulosis.** Amer. Jour. Ophth., 1932, v. 15, April, pp. 293-306.

Wilson, R. P. **Ophthalmia Ægyptiaca.** Amer. Jour. Ophth., 1932, v. 15, May, pp. 397-406.

Wulkow, Felix. **Trachosan, a new salve for treatment of trachoma and follicular catarrh.** Klin. M. f. Augenh., 1932, v. 88, May, p. 666.

Wulkow reports very good results from treatment of trachoma and follicular catarrh with trachosan, a salve containing 0.5 percent copper. It is not harmful to the human eye, does not leave a burning sensation, and seems to be superior to the usual copper preparations. *C. Zimmermann.*

6. CORNEA AND SCLERA

Balyeat, R. M. **Episcleritis due to allergy.** Jour. Amer. Med. Assoc., 1932, v. 98, June 11, p. 2054.

Transient episcleritis occurring every five to six months for ten or twelve years is reported. Thorough physical examination failed to reveal any possible focus of infection. The patient was found sensitive to many pollens, duck, goose, and chicken feathers, and several vegetables. Preseasonal pollen therapy, elimination diet, and removal

of contact with feathers led to complete relief from symptoms for over a year, except on one occasion when the patient deliberately partook of foods to which he was specifically sensitive. (Two tables.) *George H. Stine.*

Delord, Emile. **Cure of infected keratitis with hypopyon by central fistulization of the cornea.** Ann d'Ocul., 1932, v. 169, May, pp. 379-387.

The fistula is created by perforating the center of the cornea irrespective of the position of the ulcer. The heated end of a strabismus hook is used as a cautery. The opening is maintained by daily cauterizations for about three days, after which the fistula remains, to finally close about the tenth day. In each of twelve cases the cure was complete within twenty-five days. A leucoma persists, but clears to a surprising degree. Many iris adhesions occurred. Two cases developed glaucoma. The vision varied from 1/50 to 1/20 mostly. One case was improved to vision 0.3 by optical iridectomy.
H. Rommel Hildreth.

De Witt, E. N. **The histopathology of Bowman's membrane.** Trans. Amer. Ophth. Soc., 1931, v. 29, p. 461.

The author presents a survey of the pathological changes seen in Bowman's membrane in common corneal diseases.
C. Allen Dickey.

Dovbush, R. D. **On the etiologic rôle of the meibomian glands in diseases of the conjunctiva and cornea.** Sovietskii Vestnik Opht., 1932, v. 1, no. 5, p. 206. (See Section 5, Conjunctiva.)

Hippel, E. **Anatomical examination of an entire eyeball with epithelial dystrophy of the cornea (Fuchs).** Graefe's Arch., 1932, v. 128, p. 265.

A woman, sixty-five years old, complained of the vision in the right eye having become suddenly disturbed four months before consulting the author. Purulent dacryocystitis had been present for many years. The greater part of the epithelium was stippled. The intraocular tension was considerably diminished. Extirpation of the tear-sac was immediately performed. During the following two months, vesicles and later large blisters occurred in the corneal epithelium, causing much pain. Sections from the enucleated eyeball showed almost complete absence of corneal endothelium. The corneal epithelium was elevated, the epithelium generally thinned. In one spot, where the epithelium was not thinned, there lay behind the cubical cells a number of spindle-shaped intensively staining nuclei within small cells, separated from Bowman's membrane by the vesicular space.
H. D. Lamb.

Juhász-Schäffer, A. **A rare case of so-called senile corneal degeneration and cataract in a young person.** Graefe's Arch., 1932, v. 128, p. 349.

A woman thirty-three years old consulted the physicians in the eye clinic at Bern because of gradual diminution of vision in both eyes since confinement with eclampsia, seventeen months previously. Vision in the right eye was found to be 0.1, in the left eye 0.4. In each eye a yellow girdle-shaped opacity extended close to and parallel with the limbus between the two and nine o'clock positions. With the biomicroscope, the girdle-shaped opacity appeared to be composed of fat-like drops in the superficial and middle layers of the corneal tissue. A definite coronal cataract, alike in both eyes, was present. *H. D. Lamb.*

Klien-Moncreiff, Bertha. **Isolated foci of calcification in the sclera.** Arch. of Ophth., 1932, v. 7, May, pp. 757-762.

The author studied histologically two eyes in which she found well defined foci of calcareous degeneration in the sclera completely devoid of nuclei. In both instances the areas lay anterior to the tendinous insertions of the lateral recti. Their histology is indicative of a primary necrosis of the sclera. Their location, corresponding to that found by other writers, suggests that mechanical factors, as well as old age, may be responsible for their presence and

localization. Surgically, the presence of calcified scleral tissue adjoining the limbus in three surgical cases reported is of some importance. *M. H. Post.*

Krassó, Ilona. **Malignant marginal ulcers of the cornea and their treatment with border rays.** Zeit. f. Augenh., 1932, v. 77, May, p. 182.

Krasso records her findings in a number of cases of abortive Mooren's ulcer and discusses particularly the favorable influence of border-ray therapy. In a sixth case of progressive ulcer in an eye blind from glaucoma the rays were of no avail. The local effect of radiation of inflammatory cells, those that have wandered in from the blood as well as the autochthonous ones, imitates the process of spontaneous healing. Corneal scars are much more transparent after treatment with radiant energy, but it is not possible to increase the transparency of an old scar by radiation. Details of treatment are given: it is advisable that the dose be accurately measured. These rays are absorbed superficially and do not injure the lens. *F. Herbert Haessler.*

Krause, A. C. **The chemical constitution of the cornea.** Amer. Jour Ophth., 1932, v. 15, May, pp. 422-424.

McCoy, L. L. **Case of megalocornea.** Amer. Jour. Ophth., 1932, v. 15, June, p. 544.

Nugent, O. B. **Pathology and treatment of corneal ulcers.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 27-43. (See Amer. Jour. Ophth., 1932, v. 15, April, p. 381.)

O'Brien, C. S. **Nodular dystrophy of the cornea.** Trans. Amer. Ophth. Soc., 1931, v. 29, p. 416.

The author reports a case of bilateral nodular dystrophy with secondary glaucoma. Small degenerative areas were seen in the sclera.

C. Allen Dickey.

Peter, L. C. **Dystrophy of the corneal endothelium; its recognition and clinical significance.** Trans. Pacific Coast Oto-Ophth. Soc., 1931, 19th annual meeting, pp. 131-137. (See Amer. Jour. Ophth., 1932, v. 15, April, p. 382.)

Pollak, Walter. **Isolated tuberculosis of the sclera under the aspect of a tumor.** Klin. M. f. Augenh., 1932, v. 88, June, p. 747. (Ill.)

A woman aged seventy-six years presented at the upper medial portion of the sclera, bordering on the limbus, a grayish-red soft tumor of the size of a hazelnut. It consisted of granulation tissue and was, as the histological examination after extirpation proved, an isolated scleral tuberculoma. The absence of greater participation by the ciliary body and the isolated involvement of the intermediate and deeper layers of the sclera confirmed the conception that it was an isolated tuberculoma of hematogenous metastatic origin. *C. Zimmermann.*

Reese, A. B. **Intrascleral nerve loops.** Trans. Amer. Ophth. Soc., 1931, v. 29, pp. 148-153. (See Amer. Jour. Ophth., 1932. v. 15, Feb., p. 174.)

Rubbrecht, R. **A new treatment for progressive ulcers of the cornea.** Bull. Soc. Franç. d'Opht., 1931, 44th year, pp. 331-340.

Rubbrecht treats pneumococcic ulcer by early incision and conjunctival flap, and by dacryocystorhinostomy if an infected sac is present. First the ulcer is curetted carefully and all necrotic tissue removed. An incision is then made with a convex scalpel, cutting obliquely, and extending into the healthy tissue on each side of the ulcer. The direction of the incision is determined by the site of the ulcer, but the center of the cornea is always avoided. After evacuation of the aqueous, a conjunctival flap is raised and sutured in such a manner as to cover the ulcer entirely. A binocular dressing is left in place forty-eight hours and is then renewed every three or four days. The conjunctiva is found to have become adherent to the ulcer and to have vascularized it.

Phillips Thygeson.

Shihinashvili, N. J. **On the pathology of ribbon-shaped degeneration of the cornea.** Sovietskii Vestnik Oft., 1932, v. 1, no. 4, p. 147.

Four eyes with ribbon-shaped opacities of the cornea were examined histologically. In one case the eyeball was atrophic as the result of a tuberculous iridocyclitis: the calcium deposits were found mainly in Bowman's membrane. Two other cases revealed progressive calcium impregnation of various parts of the cornea in the following order: endothelium, blood vessels, corneal corpuscles, epithelium, corneal fibrillæ. The ribbon-like opacity of the fourth case was due to complete hyalinization of the corneal parenchyma, which had become destroyed by what was probably an intracorneal hemorrhage.

M. Beigelman.

Wiener, Meyer. **Serpent ulcer accompanying eserin sensitization.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 543-546.

7. UVEAL TRACT, SYMPATHETIC DISEASE, AND AQUEOUS HUMOR

Adie, W. J. **Tonic pupils and absent tendon reflexes: a benign disorder sui generis; its complete and incomplete forms.** Brain, 1932, v. 55, pt. 1, p. 98.

The author differentiates between the Argyll Robertson pupil, fixed pupils, and internal ophthalmoplegia. The tonic pupil is differentiated from the Argyll Robertson pupil by the following: (1) It is usually unilateral instead of bilateral. (2) It is nearly always larger rather than smaller than its fellow. (3) The pupil is never very small. (4) There is reaction to light and dark, although slow. (5) Contraction to convergence and dilatation after convergence occur slowly. (References.)

Ralph W. Danielson.

Carrère, L. **Recurrent purulent iridocyclitis.** Bull. Soc. Franç. d'Opht., 1931, 44th year, pp. 345-351.

Carrère reports a case of recurrent purulent iridocyclitis involving first one eye and then the other, and clearing without appreciable visual damage. No form of treatment seemed to benefit the condition or to prevent recurrence. The author is unable to come to a definite conclusion regarding the etiology of the condition. He was able to eliminate tuberculosis, syphilis, gonorrhea, and rheumatism as possible causes, and was unable to obtain a positive blood culture on two attempts made during activity of the disease.

Phillips Thygeson.

Damel, Carlos. **Premonitory symptoms of sympathetic ophthalmia.** Arch. de Oft. de Buenos Aires, 1932, v. 7, March, p. 133.

The author describes in detail his findings in a case of early sympathetic ophthalmia, in which he confirms the findings of Vogt. These alterations are only visible with the slitlamp, and all eyes that have been subjected to any form of injury, either operative or traumatic, should be examined by this method even when experiencing no subjective symptoms. The early signs are precipitates on the posterior surface of the cornea, particularly in the central and inferior portions. With proper magnification these can be seen as white or grayish-white dots, often interspersed with fine strands of fibrin. There is a bedewing of the endothelial lining of the cornea.

Isolated cells may be seen floating in the aqueous, which later become attached to the corneal or lens surface, forming the characteristic precipitate. The vitreous also contains a sprinkling of white or reddish cells, and its fiber framework becomes more clearly defined.

A. G. Wilde.

Dascolopoulos, Nico. **Two cases of recurring uveitis.** Ann d'Ocul., 1932, v. 169, May, pp. 387-393.

These two cases had certain points in common with each other and with similar cases found in the literature. The hypopyon was not grave, would clear very rapidly, and the associated pericorneal injection was very slight. The synechiæ broke promptly under treatment. Ulcers of the buccal mucous membrane were a common finding in all cases. Etiologically there is evidence

pointing toward tuberculosis and also bacteriemia from staphylococcus or other common pus organisms.

H. Rommel Hildreth.

Edgerton, A. E. **Uveitis due to sinusitis.** Amer. Jour. Ophth., 1932, v. 15, June, pp. 544-546.

Edmund, Carsten. **The gonococcus complement fixation reaction and gonorrheal iridocyclitis.** Acta Ophth., 1932, v. 10, pts. 1-2, p. 151.

A highly positive reaction is practically pathognomonic of the presence of a gonorrheal infection, and calls for thorough investigation of the genitourinary organs, and subsequent treatment. A positive laboratory test justifies the ophthalmologist in recommending such a procedure, even in the face of a negative venereal history. The early recognition and elimination of such a focus is of prognostic importance in preventing relapses, which are so characteristic of this infection.

Ray K. Daily.

Enroth, Emil. **Rheumatic iritis and the weather.** Acta Ophth., 1932, v. 10, pts. 1-2, p. 146.

The author studied 197 cases of rheumatic iritis, seen at Helsingfors from 1922 to 1930, with special reference to the influence of the weather. He found twenty-seven days during each of which several patients presented themselves with attacks of iritis. In studying the meteorologic status of these days he found that twenty-four of them were located on the downward or upward curve, or close to the bottom, of a cyclonic atmospheric depression. Such atmospheric phases represent a complete change of climate, from the tropical air which is warm, humid, electrically charged and rich in ions into the polar air which is cold, dry and poor in electric energy and ions. The author believes that this sudden climatic change predisposes to iritis.

Ray K. Daily.

Friedenwald, J. S., and Pierce, H. F. **Circulation of the aqueous: 2. metabolism of reabsorption of fluid.** Arch. of Ophth., 1932, v. 8, July, pp. 9-23.

This paper deals with the rate of escape of fluid from the anterior chamber under varying conditions. The former idea that the walls of Schlemm's canal provided the portal for this discharge has been disproved, as has the conception of simple filtration by this channel. No evidence has been produced to show that active secretion takes place either along the same route, or by way of the vessels of the iris. The authors find that reabsorption of the aqueous takes place from the anterior chamber, except for slightly less than one per cent of the total flow. When the pressure in the anterior chamber rises by from 3 to 10 mm. of mercury, reabsorption proceeds at from five to ten times the normal rate. Vasocongestion of the iris and pericorneal vessels was found to increase the rate of absorption of the aqueous, tending to lower the intraocular pressure. A mechanical hypothesis for reabsorption of the aqueous is outlined, based upon the conception that the vascular endothelium acts on the whole as an inert, semipermeable membrane, acted upon by the difference in osmotic pressure on its two sides in coordination with the different hydrostatic pressure on the two sides of the membrane. Other forces such as surface electrical charges may also play a part.

M. H. Post.

Friedenwald, J. S., and Pierce, H. F. **The circulation of the aqueous—preliminary report.** Trans. Amer. Ophth. Soc., 1931, v. 29, pp. 153-163. (See Amer. Jour. Ophth., 1932, v. 15, July, p. 660.)

Havel, Jaroslav. **Subconjunctival lens dislocation.** Oft. Sbornik, 1931, v. 6, pp. 252-254.

A woman aged fifty years was hooked in the right eye by a goat's horn. The sclera was ruptured and lens dislocated under the conjunctiva. The injury remained for three weeks without special treatment, and the eye became blind. At the end of three weeks the patient, owing to pain and loss of visual power in the left eye, was compelled to visit the clinic and the right

eye was enucleated. In the left eye there was a severe iridocyclitis with numerous precipitates and vitreous opacities. Blood Wassermann 4 plus. Energetic antiluetic treatment was ordered, together with salicylates and, of course, atropin. Vision quickly improved from fingers at five meters to 6/8. Because of the blood Wassermann and the prompt action of the antisyphilitic treatment, as well the fact that in the course of one and a half years there had been no relapse, the author regarded the disease of the left eye as syphilitic. (Bibliography.)

G. D. Theobald.

Hippel, E. **A case with anatomical findings of iridocyclitis with recurring hypopyon.** Graefe's Arch., 1932, v. 128, p. 272.

A man, after suffering for fourteen months with recurring iritis and hypopyon in both eyes, lost all vision in the right eye from secondary glaucoma. Because of pain the eye was enucleated four months later. The left eye continued in the same course until its vision was lost as the result of a secondary glaucoma twenty months from the beginning of the trouble. Anatomical examination of the enucleated right eye suggested a metastatic purulent process which had involved the eye through the central retinal vessels and the long ciliary arteries. The disease had begun in the central part of the retina and the uveitis had followed.

H. D. Lamb.

McGrath, W. M. **Observations upon abnormalities of the pupil and iris in tabes dorsalis, general paralysis, and taboparesis.** Jour. Mental Science, 1932, v. 78, April, p. 362.

The interesting feature of the paper is the description of segmental atrophic changes in the iris, to which segmental loss of light reaction and pupil irregularity are due. The underlying nervous lesion must be in the peripheral neuron. The observations recorded here are not compatible with a central lesion in the mid-brain. The so-called Argyll Robertson pupil of nonsyphilitic lesions of the nervous system is clinically distinguishable because it is accompanied by pupil dilatation, and is characterized by absence of miosis, of pupil irregularity, and of trophic changes in the iris. (References and drawings.)

Ralph W. Danielson.

Meller, J. **Demonstration of tubercle bacilli in uveitis by culture from the tissue of the interior of the eye.** Zeit. f. Augenh., 1932, v. 77, April, p. 1.

The value of this single case report can hardly be overemphasized, since it presents an extremely important piece of evidence in demonstrating the tuberculous etiology of uveitis. A student whose right eye was amblyopic since childhood, and had been operated on for correction of strabismus and to free the pupil, suddenly became afflicted with a severe inflammation which caused the previously sound left eye to become blind six months before he was seen by Meller. The lungs were found negative by an internist and a roentgenologist. There was no reaction to injections of tebeprotein in dilutions up to 1 to 10,000, but four plus with 1 to 1000. Since there were exacerbations of inflammation in the somewhat shrunken eye, and the right eye frequently became injected during the course of therapeutic injection of tebeprotein, the left eye was enucleated. Only a small fragment was abscinded for histologic study. The greater portion was used by Löwenstein for inoculation of cultures, in which tubercle bacilli grew in four weeks. Tubercle bacilli could not be found in the histologic preparation. Reexamination by internist and roentgenologist revealed postpleuritic fibrous tuberculosis with apical caps and axillary gland involvement, denudation of the heart, and increase in the size of the splenic dullness. In the search for tuberculous etiology the oculist must not be discouraged by a negative report even from a competent internist. The tubercle bacilli are evidently present in such lesions, but do not stain with our present histologic technique.

F. Herbert Haessler.

Parker, W. R., and Fralick, F. B. **Choroideremia.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 240-246. (See Amer. Jour. Ophth., 1932, v. 15, Feb. p. 176.)

Rischard, Michel. **The motor innervation of the iris.** Ann. d'Ocul., 1932, v. 169, June, pp. 464-475.

The author claims that the iris musculature does not consist of a separate sphincter and dilator muscle but that the diaphragm is a single mucle, innervated directly by the sympathetic nerve, while the oculomotor nerve acts indirectly by inhibiting the action of the sympathetic. An analogous action takes places in the bladder, in which the sympathetic nerve causes relaxation of the sphincter during micturition, while the pelvic nerve activates the bladder to contract. Physiological, pharmacological, and histological data are presented as evidence for this contention. *H. Rommel Hildreth.*

Rones, Benjamin. **Uveitis with dysacousia, alopecia, and poliosis.** Arch. of Ophth., 1932, v. 7, June pp. 847-855.

The author reports three cases presenting the picture of severe uveitis, resulting in secondary glaucoma and later phthisis bulbi, accompanied by loss of hair, depigmentation of skin and hair, and transient deafness. All gave negative Wassermann and tuberculin reactions. One gave a positive uveal pigment test, the two others a negative, but since they were past the acute stage this failure does not rule out the possibility that the process is an anaphylactic one. The audiometer reading, taken only in case three, showed recovery of perfect hearing. Endocrine dysfunction was found in none. The relation to sympathetic ophthalmia must not be overlooked, and it is possibly indicated that disturbance of the uveal tract, even nontraumatic, may result in an allergic reaction. *M. H. Post.*

Samuels, Bernard. **Postoperative nonexpulsive subchoroidal hemorrhage.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 392-404. (See Amer. Jour. Ophth., 1932, v. 15, April, p. 385.)

Sexe. **Severe sympathetic ophthalmia. Temporary amelioration during intercurrent influenza.** Bull. Soc. Franç. d'Opht., 1931, pp. 353-357.

Sexe reports the case of a man of forty-five years who developed sympathetic ophthalmia after a penetrating injury to the left eye. When first seen both eyes were involved and enucleation of the wounded eye failed to affect the progress of the disease in the other eye. Strenuous mercury and salicylate therapy was also without effect on the disease over a thirty-eight day period. At this point, the patient developed influenza with fever reaching 104.2°F., and three days later he noted distinct improvement in vision. This improvement continued from light perception to 0.1 or more. An attack of secondary glaucoma due to pupillary occlusion developed, and necessitated treatment by iridectomy. Although the tension dropped rapidly to normal all visual gain was lost. Further treatment with mercury and with foreign protein failed to improve the condition.
Phillips Thygeson.

Shapira, T. M. **Heteroplastic ossification in the choroid.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 721-725.

Streiff, J. **Agreement and lack of agreement of the colors of the skin, hair and iris. Hereditary participation of the uvea and participation of the sympathetic nerve in the final form and color of the iris.** Klin. M. f. Augenh., 1932, v. 88, May, p. 577.

To ascertain these relations Streiff examined 166 pupils of the Swiss school of Genoa in all detail and he reports the results in tabular form. Dark eyes occurred very predominantly in dark haired, and only exceptionally in blond, individuals. The most striking result was the great frequency of light (blue and gray) eyes with brown and dark hair (23 cases against 27 in blonds). Of all the 166 children 92 showed correspondence of hair and iris

color, 37 a medium tint, and 37 an opposite coloration, that is, a quarter of the cases had trichiridodyschromia, and with regard to skin and iris one ninth had dermatiridodyschromia. Streiff concludes that intimate relationships must exist between individual variations in the "anlage" of the endings of the sympathetic nerve in the iris and variations in the local arrangement of the chromatophores, and that normally the development and involution of the anterior stratum and with it the distribution of the pigment in the iris stroma is connected with the various formation of the sympathetic syncytium. Thus Streiff's assumption in heterochromia of regular participation of the sympathetic nerve in the final structure and coloration even of normal types of iris has a morphological basis.

C. Zimmermann.

Streiff, J. **Revision of older and more recent observations for the understanding of true early heterochromia.** Klin. M. f. Augenh., 1932, v. 88, June, p. 751.

From this revision Streiff attempts to confirm the importance of hereditary disturbances of the pigment anlage and a coordinated anlage of the sympathetic nerves. While he formerly assumed that the complications of Fuchs' heterochromia may be explained as due to vasomotor disorder of the ciliary body from defective development, he surmises an additional hormonal factor that might provoke such disturbances of the defective pigmental and neural anlage. The renewed attempt to classify Fuchs' heterochromia under tuberculous eye diseases is rejected.

C. Zimmermann.

Vasek, Emil. **Sympathetic central chorioretinitis.** Oft. Sbornik, 1931, v. 6, 1931, pp. 200-201.

The left eye of a male aged fifty-three years had a vitreous hemorrhage eleven days after iridectomy for glaucoma. Three months later the cataractous lens was removed and a marked iridocyclitis followed. During this time there developed in the macula of the other eye a deposit which presented itself as a "greyish-yellow marbling with massive shifting of pigment." Although the etiological diagnosis was uncertain, sympathetic disease appeared unlikely, because the region of the macula was not completely normal (senile change) even before the operation. The pigment scotoma and the unchanging condition also speak against sympathetic disease.

G. D. Theobald.

Verhoeff, F. H. **Nature and origin of the pigmented streaks caused by separation of the choroid.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 82-93. (See Amer. Jour. Ophth., 1932, v. 15, April, p. 387.)

Verhoeff, F. H. **Tuberculous chorioretinitis.** Trans. Amer. Ophth. Soc., 1931, v. 29, p. 417. (See Section 10, Retina and vitreous.)

8. GLAUCOMA AND OCULAR TENSION

Abraham, S. V. **Anterior chamber punctures in relation to intraocular tension: a critical study.** Arch. of Ophth., 1932, v. 7, June, pp. 888-900.

Withdrawal of the aqueous resulted in hyperemia, especially of the ciliary body, and increased intraocular tension. In cases of subnormal function, such as optic atrophy or amblyopia, a fall in tension may follow withdrawal of the aqueous. A similar result may be obtained by the use of atropin, reducing the activity of the ciliary body. In primary or secondary glaucoma, the tension may be higher in some cases, in others lower. *M. H. Post.*

Caballero, F. **Consideration of the pathogenesis of glaucoma.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, June, p. 303.

From a review of the literature dealing with simple glaucoma the author concludes that experimental work has so far not established the dependence of intraocular tension on pressure in the intraocular vessels, that Leber's theory as to circulation and elimination of the aqueous humor is still valid, and that the mechanism of hypertension, as to

whether it is due to blocking of the angle or to variation in permeability of Schlemm's canal, requires further study. (Bibliography.)

M. Davidson.

Carle, Torsten. **Choked disc following attack of glaucoma.** Det oft. Selskab i Køpenhavn's Forhandlinger, 1931, p. 31. In Hospitalstidende, 1932, May 19.

Two cases of edema of the disc in acute glaucoma are reported, both in women in the sixties, and the edema in each case following rapid lowering of the tension by miotics. After normal tension for about a week, the edema had disappeared. The explanation may be found in Schmidt-Rimpler's theory of the cause of glaucoma, that during the acute attack of increased tension in the eyeball there results increased tension in the optic nerve, which persists after bulbar tension becomes normal, so that transudation from the nerve into the disc occurs.

D. L. Tilderquist.

Cocuzza, S. **Two cases of acute glaucoma cured by corneal inflammation induced by calomel.** Ann. di Ottal., 1932, v. 60, Jan., p. 51.

The irritant action of impalpable calomel powder in certain corneal affections is well known. In a case of acute glaucoma in a dog the author obtained resolution after its local application. In the African desert, with no surgical instruments available, an Arab presented himself with a history and symptoms of inflammatory glaucoma. Powdered calomel was freely applied over the superior portion of the cornea. After several hours an inflammation of the cornea and iris supervened with distension of the vessels but with relief of pain, diminution of tension, and restoration of the normal depth of the anterior chamber. Five months later there had been no recurrence of the trouble. A similar result occurred in the case of a native woman, with no return of the symptoms during the author's stay in Cyrenaica. (Bibliography.)

Park Lewis.

Cohen, M., Killian, J. A., and Halpern, L. **Chemical composition of the blood and spinal fluid in primary glaucoma.** Arch. of Ophth., 1932, v. 8, July, pp. 39-49.

The authors conclude that in chronic primary glaucoma the plasma and spinal fluid proteins, the blood and spinal fluid sugar or chlorides, the serum and spinal fluid calcium, and the inorganic phosphorus and sodium do not vary from the normal. But the ratio between the inorganic phosphorus of the spinal fluid and of the serum may be slightly high. No striking difference was found between the blood and spinal fluid of patients with glaucoma and that of those with other ocular diseases. The paper contains a brief review of the literature and much detailed report of investigation.

M. H. Post.

Courtney, R. H., and Hill, Emory. **Hereditary juvenile glaucoma simplex.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 47-64. (See Amer. Jour. Ophth., 1932, v. 15, Feb., p. 178.)

Diaz Dominguez, D. **The immediate results of iridencleisis in glaucoma.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, June, p. 319.

The author's modification of Holth's iridencleisis has given him the greatest satisfaction. The conjunctival flap is made as if for an Elliot, the scleral section is made with a Graefe knife layer by layer and deliberately irregular, and the iridotomy is made to the base. Twenty-two cases (fifteen persons) are reported in detail. The eye was soft in almost all cases on removal of bandage, and called for atropin. Only two cases required a second operation to normalize the tension. The cases included acute, absolute, and chronic inflammatory glaucoma, glaucoma secondary to thrombosis of the central retinal vein, and chronic iritis. Neither cataract, nor a very shallow anterior chamber, nor extreme hypertension is a contraindication. The only contraindication is iridocyclitis. (Bibliography.)

M. Davidson.

Duke-Elder, W. S., and P. M. **The clinical significance of the ocular musculature, with special reference to the intraocular pressure and the circulation of the intraocular fluid.** Brit. Jour. Ophth., 1932, v. 16, June, p. 321.

The writers do not think that sufficient attention has been devoted in the literature to the effect of the activity of the extraocular and intraocular musculature upon the pressure of the eye. Graphs illustrating the effects of the intraocular muscles upon intraocular pressure are presented, with a study of the intraocular muscles in relation to the opening of the canal of Schlemm and their effect in compressing the arteries supplying the anterior part of the eye. When intraocular pressure is raised above normal, the normal chamber pressure of the eye constricts the exit veins. Atropin, by releasing all pressure on the arteries supplying the anterior uveal tract, and allowing the veins of the anterior part of the choroid to collapse, tends to produce a condition of circulatory stasis and hyperemia. Eserin, on the other hand, by constricting the arteries and opening up the veins, restricts the inflow and aids the outflow of blood, as well as accelerating the outflow of fluid through the drainage angle. The former thus tends to raise intraocular pressure, the latter to lower it. *D. F. Harbridge.*

Hagen, Sigurd. **The comparative value of Holth's tangential sclerectomy and iridencleisis.** Acta Ophth., 1932, v. 10, pts. 1-2, p. 88.

This is a study of the glaucoma material at the government hospital in Oslo. From 1921 to 1927 sclerectomy was the operation of choice; since 1927 iridencleisis. Sclerectomy was done on 493 eyes, and iridencleisis on 175. After sclerectomy 215 eyes were followed, and 81 after iridencleisis. Normal tension without the use of miotics was found in 81.9 percent of eyes after sclerectomy, and 75.3 percent after iridencleisis. With the postoperative use of miotics, however, the favorable results after iridencleisis rise to 93.8 percent as compared with 84.2 percent after sclerectomy. The preoperative vision and the extent of the visual fields were maintained in 59.3 percent after sclerectomy, and 86.3 percent after iridencleisis. The poorer results after sclerectomy are due to the comparatively greater frequency of postoperative cataract and hypotony after this operation. *Ray K. Daily.*

Magitot, A. **The aqueous humor in glaucoma.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 338-356. (See Amer. Jour. Ophth., 1932, v. 15, Feb., p. 180.)

Marlow, S. B. **Visual fields in chronic glaucoma.** Arch. of Ophth., 1932, v. 7, Feb., pp. 211-223; also Amer. Acad. of Ophth. and Otolaryng., 1931.

Marlow suggests increasing the sensitivity of the ordinary tangent screen field tests by reducing the illumination of the screen. The author closes the blinds in his office. A normal case should be examined immediately after a pathological one, at least until a rough standard has been established. A number of cases are presented, with the fields taken under both degrees of illumination, that is, with the blinds of his office widely open, and later closed. *M. H. Post.*

Sabata, J. **An interesting case of secondary glaucoma in subluxation of the lens following injury.** Oft. Sbornik, 1931, v. 6, pp. 202-204. (See Section 9, Crystalline lens.)

Shope, Pierce. **A study in tonometric measurements.** Amer. Jour. Ophth., 1932, v. 15, Aug., pp. 739-743.

Vail, D. T., Jr. **Adult hereditary anterior megalophthalmos sine glaucoma; a definite disease entity, with special reference to the extraction of cataract.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 249-272. (See Amer. Jour. Ophth., 1931, v. 14, Dec., p. 1292.)

9. CRYSTALLINE LENS

Bieringer, Stephan. **Extraction of the lens in aniridia.** Klin. M. f. Augenh., 1932, v. 88, June, p. 744.

Three cases are reported. In two cases the indication for extraction of the lens was based upon poor vision from cataract and in the third increased tension from dislocation of the cataractous lens. In the latter the operation did not lower the intraocular pressure. The operations with prolapse of liquefied vitreous were successful, but in every case the opacities of the cornea prevented good visual results. There are no contraindications for extraction of cataract or dislocated lens in irideremia, but, on account of the usually liquefied vitreous, precautions such as akinesis, bridle suture, and retrobulbar injection are necessary for reducing intraocular pressure to restrict loss of vitreous. *C. Zimmermann.*

Franta, J. **Glaucoma secondary to cataract.** Oft. Sbornik, 1931, v. 6, pp. 142-153.

1920-1930 at the Czech clinic in Prague, fourteen patients with glaucoma secondary to intumescent cataract were treated as follows: In seven, iridectomy was done, followed by cataract extraction two weeks later. In four, scleral puncture was done, followed by extraction: two eyes were lost. In two, iridectomy and extraction. In one, cyclodialysis. In two, enucleation of amaurotic eyes. In only three eyes was the visual acuity better on discharge. The prognosis in these cases is serious. (Bibliography.) *G. D. Theobald.*

Gifford, Harold, Jr. **Determination of the oxidation-reduction mechanism in the lens of rabbits with naphthalene cataract.** Arch. of Ophth., 1932, v. 7, May, pp. 763-768.

Glutathione was found by the author to be absent in human cataractous lenses, in accordance with the findings of previous investigators. The finding that it was reduced in advanced naphthalene cataract also corresponds with the findings of other writers. In the author's studies, opacities of the lens were found in the presence of only very slight reductions in the amount of glutathione, the amount of the latter becoming less and less as the lens changes progressed. It cannot, however, be urged that the two are interdependent, and they must be considered rather as coincidental. In all the author's experimental cases a trace of glutathione was present, evidently enough to keep the cystein to cystin interchange going at a normal rate. In keeping with these findings, it was observed that the nitroprusside reaction and the reduction of methylene blue were not impaired. In human cataracts with complete absence of glutathione, the nitroprusside and methylene blue reactions are absent. *M. H. Post.*

Handmann, D. **Further communications on rosette cataract (bilateral occurrence).** Klin. M. f. Augenh., 1932, v. 88, May, p. 601. (Ill.)

Rosette cataract was first described by Fuchs in 1888 under the name of "stellar cortical cataract." He found it without known cause in otherwise healthy eyes. Vogt described it under traumatic cataract. Handmann reports in detail twenty-eight cases, nine traumatic and nineteen not traumatic. Hence he considers it as premature to assume an exclusive traumatic genesis. Finally Handmann sketches his adherence to the recently much discussed theory of crowding of originally subcapsular opacities into the depth, creating a cataract which is separated by clear new-formed cortical substance from the sometimes similarly shaped opacity at the capsule.
C. Zimmermann.

Kahoun, Svatopluk. **Cataract and senile central retinitis.** Oft. Sbornik, 1931, v. 6, pp. 247-251. (See Section 10, Retina and vitreous.)

Klauber, E. **Concerning prophylaxis and treatment of inflammatory complications following cataract extraction.** Oft. Sbornik, 1931, v. 6, pp. 244-246.

The author has found intramuscular injection of atophan useful as a prophylactic measure as well as a curative measure in nonspecific iritis following cataract extraction. It is preferable to

milk injection because it causes neither rise in temperature nor pain.

G. D. Theobald.

Lacarrère, J. L. **Electrodiaphakia.** Klin. M. f. Augenh., 1932, v. 88, June, p. 778. (Ill.)

A new instrument for extraction of cataract is described, in which the perforating and coagulating action of the high frequency current is utilized as traction power. The needles, applied to and penetrating the anterior capsule, form with the albuminoid coagulation of capsule, cortex, and nucleus a coherent body, so that the traction is extended over the whole mass. The author had excellent results in seven out of the first ten cases and will report more concrete data in a future article.

C. Zimmermann.

Lacarrère, J. L. **Our new method of intracapsular extraction of senile cataract; electrodiaphakia.** Arch. de Oft. Hisp.-Amer., 1932, v. 32, June, p. 293.

The new procedure is based on the principle of harpooning the lens by penetrating into its interior, without destroying the capsule, and overcoming the resistance of the zonule by converting the whole lens into a solid coagulate. This has been achieved by a high frequency current with success in ten cases, after preliminary experimental work. The instrument consists of a handle ending in a glass tube, from which project and bifurcate two millimeters of two 0.14 mm.-caliber wires. These are released by a push button in the handle, after a pedal switch has turned on the current. No pressure is exerted on the lens by the needles, their penetration being preceded by an electric flash. Experiments with various electrodes indicate the possibility of using flat electrodes applied to the capsule without penetration. In intumescent cataract the semiliquid masses are seen to be extruded and to coagulate simultaneously. (Illustrations.)

M. Davidson.

Lewis, Park. **Cataract in the eyes of fresh water fishes due to the invasion of the larvæ of trematoid worms.** Trans. Amer. Acad. Ophth. and Otolaryng., 1931, 36th annual meeting, pp. 143-155. (See Amer. Jour. Ophth., 1932, v. 15, April, p. 393.)

O'Brien, C. S. **Hyperglycemia in persons with advanced senile cataract.** Sec. on Ophth., Amer. Med. Assoc., 1931, 82nd session, pp. 132-145. (See Amer. Jour. Ophth., 1932, v. 15, April, p. 394.)

Olah, Emil. **The technique of preparing for cataract operation.** Amer. Jour. Ophth., 1932, v. 15, July, pp. 626-632.

Sabata, J. **An interesting case of secondary glaucoma in subluxation of the lens following injury.** Oft. Sbornik, 1931, v. 6, pp. 202-204.

A man aged sixty-five years received a blow on the left eye. The injury caused subluxation of the lens. This on bending forward caused almost immediately an attack of glaucoma, which would subside on lying down. Three months later, on account of the attacks of glaucoma when bending forward, the lens was removed. Four months later the patient returned with a history of pain. There was marked iridocyclitis and atrophy, with detached retina. Enucleation was necessary.

G. D. Theobald.

Seefelder, R. **The increase of intraocular pressure after needling of secondary cataracts.** Sovietskii Vestnik Opht., 1932, v. 1, no. 5, p. 191.

Although at the Innsbruck clinic cataract extractions are done with a large capsulectomy, discissions of secondary membranes have to be performed in about ten percent of all cases. The glaucomatous complications observed after these needlings in the last twelve years are divided by Seefelder into three groups. The first group is characterized by a slight and transient increase of tension which may be overlooked unless the tonometer is used routinely. In the next group a sudden and extreme hypertension resembling an attack of acute glaucoma results from prolapse of the vitreous

into the anterior chamber. It can be always controlled by the use of miotics. In the third group Seefelder discusses cases of postoperative hypertension in which the iris protrudes forward while its free border seems to be drawn backward. He believes that in these cases the vitreous interferes with the free passage of aqueous into the anterior chamber by blocking the pupillary area or the discission opening. If surgical relief becomes necessary in these cases, transfixion of the iris is the procedure of choice. Iridectomies are contraindicated because of danger of vitreous prolapse. *M. Beigelman.*

Ubaldo, A. R., and Ayuyao, C. D. **Cataract among Filipinos.** Jour. Philippine Islands Med. Assoc., 1932, v. 12, April, p. 160.

The authors outline the clinical types of cataract, the occupation, associated conditions, type of operation, and complications in about 500 cases. Attention is called to the high percentage of cases among the laboring classes, and the opinion is expressed that there is some relationship to the hardships endured. *Ralph W. Danielson.*

Updegraff, Helen. **Calcium, phosphorus, and cholesterol in cataractous vs. apparently normal lenses from human eyes.** Proc. Soc. for Exper. Biol. and Med., 1932, v. 29, May, p. 964.

This is in the nature of an exercise in research, and gives very briefly some figures as to the percentages found for the substances mentioned.

10. RETINA AND VITREOUS

Atkinson, W. S. **Angiomatosis retinæ with cerebellar cyst (Lindau's disease).** Trans. Amer. Acad. Ophth. and Otolaryng., 1931, 36th annual meeting, pp. 106-112. (See Amer. Jour. Ophth., 1932, v. 15, July, p. 662.)

Csapody, I. **The lens in the etiology of retinal rupture.** Klin. M. f. Augenh., 1932, v. 88, June, p. 783.

Detachment of the retina after cataract extraction and operation for secondary cataract is most likely due to peripheral tear of the retina. By such operation or by injury the ora serrata, the thinnest part of the retina, may be damaged through tension on the zonule. Under more ordinary conditions the mode of suspension of the lens, and also the ocular movements, may act as mechanical factors in producing retinal tears. *C. Zimmermann.*

Dvorak, Lothar. **Three rare cases of malformation of the fundus.** Klin. M. f. Augenh., 1932, v. 88, May, p. 643. (Ill.)

A man of forty years presented in his otherwise normal left eye a persistent Cloquet's canal. The second patient, a man aged twenty-nine years, showed in his divergent left eye, which counted fingers at 1 mm. and had a central scotoma of sixty degrees, glial epipapillary membranes covering the physiological excavation, and ending in a short filament which was apparently a remnant of Cloquet's canal. The lower third of the otherwise perfectly normal left disc of the third patient, a man of nineteen years, was covered by a light grayish-white, smooth, sharply defined formation projecting 3 D. into the vitreous, and which was diagnosed as congenital glial cyst of the optic nerve. *C. Zimmermann.*

Grönblad, Ester. **Angioid streaks and pseudoxanthoma elasticum.** Acta Ophth., 1932, v. 10, supplement.

In 1929 Grönblad and Strandberg reported three cases in which angioid streaks and pseudoxanthoma elasticum coexisted. Grönblad considers angioid streaks as the ocular manifestation and pseudoxanthoma elasticum as the cutaneous manifestation of a systemic dystrophic process in the elastic tissue of the body. The pathological histology of pseudoxanthoma elasticum consists in a degeneration of the elastic tissue of the cutis. Angioid streaks have not been subjected to microscopic examination. A study of the literature and the course of the three cases, two of which were rapidly progressive, lead the au-

thor to conclude that the streaks are not due to hemorrhage, retinal folds, or blood vessels; but that they are caused by a degenerative process in the elastic substance of these parts, which produces ruptures and band-shaped defects in the lamina vitrea and the inner portions of the choroid. The changes in the retinal pigment epithelium, which may develop simultaneously with development of the streaks but usually come late in the disease, and the retinal hemorrhages are probably secondary changes. The involvement of the macula which usually comes late in the disease is similar to senile disciform degeneration, which is attributed by Behr to degenerative changes in the lamina elastica. (Complete bibliography, photographs and drawings of the fundus, photographs of the patients showing the skin lesions, and photomicrographs of the skin.)

Ray K. Daily.

Kahoun, Svatopluk. **Cataract and senile central retinitis.** Oft. Sbornik, 1931, v. 6, pp. 247-251.

In the Brno clinic from 1923 to 1931 there were 2,272 extractions of senile cataract in patients over the age of fifty-five years. Senile degeneration of the macula was found immediately after the extraction in twenty eyes, or 1.7 percent. Among 6,722 ambulant patients over fifty-five years old who were examined in the clinic during this period were found 136 cases, or 2.3 percent with senile degeneration of the macula. In nine-tenths of these cases the changes were bilateral. According to this percentage, complication of central retinitis with cataract appears to be a coincidence. (Bibliography.)

G. D. Theobald.

Krug, E. F., and Rohdenburg, G. L. **Foreign substance injected into the vitreous of the rabbit. Pathway of transportation from one eye to its fellow; an experimental study.** Arch. of Ophth., 1932, v. 8, July, pp. 71-91.

The authors first point out that lymph channels exist in the optic nerve and chiasm, as do also tissue spaces or clefts communicating with them. These spaces have been noted to contain a hyaline substance, wandering cells, and so on. The authors sought to show the action of these channels by injection of various substances into the vitreous. They found that oils injected into the vitreous could be traced throughout the optic nerve and chiasm, and that they appeared in the nerve-head of the fellow eye. When living bacteria were injected directly into the vitreous, such an inflammatory reaction was produced that the lymph clefts became closed and migration along the channels impossible. Wandering cells, nevertheless, may pick up foreign soluble protein, such as old tuberculin, when injected into the eye, and may carry it from there to the fellow eye. The paper is illustrated by numerous photomicrographs. *M. H. Post.*

Kurz, Jaromir. **Spasms of retinal vessels.** Oft. Sbornik, v. 6, 1931, pp. 188-199.

The literature is reviewed and discussed. The author reports three cases which belong to this group and which differ in many ways from those in the literature.

Case 1. Male, aged thirty-four years for several years had attacks of migraine. For the past two months had attacks of greatly blurred vision, lasting a few minutes and disappearing as quickly as they came. Between attacks the fundi appeared normal. One day while in the clinic he had such an attack. The arteries were contracted to a fine line, even on the papilla, and the blood was seen only in the arteries near the equator. The veins appeared as usual. The attack lasted about three minutes, suddenly the arteries were filled with blood and appeared normal. No abnormal physical findings.

Case 2. Nurse aged twenty-nine years, with negative family and personal history, complaining of blurring of vision of the right eye. Physical examination revealed tuberculosis in the apex of one lung; fundus examination showed a solitary tubercle of the retina. In the course of treatment, at irregular

intervals, she complained of attacks of blurred vision in the upper field which lasted several minutes, the vision then returning to normal. There were no visible changes. After the last attack, normal vision did not return, and the inferior branch of the retinal artery was narrowed without any change in the adjacent area. Within fourteen days, the condition improved, but a moderate narrowing of the visual field remained.

Case 3. The symptoms in this case of spasm of the retinal vessels were similar to those of acute retrobulbar neuritis. A female aged thirty-three years suddenly saw a cloud in front of her right eye. Beside an old chorioretinal change, the ophthalmoscope showed slight opacity of the papilla and surrounding retina, and marked narrowing of the arteries. Vision was fingers at 3 m. and with the perimeter a central scotoma was found. In the course of about twenty hours vision returned, the retinal vessels widened to normal, and the central scotoma disappeared. (Bibliography.) *G. D. Theobald.*

Larsson, Sven. **Electro-endothermy in detachment of the retina.** Arch. of Ophth., 1932, v. 7, May, pp. 661-680.

In this paper the author reports forty cases of detachment of the retina, both with and without demonstrable tears, operated on by electro-endothermy. In fifty percent of these the retina was reattached. This percentage would have been considerably greater had not a number of cases now known to have been entirely unsuitable been included in the series. At operation no definite localization is attempted. The sclera is widely exposed, one or two recti being tenotomized if necessary. The active electrode in the form of a metallic ball is applied over a large area. Each contact is maintained for five seconds. Immediately afterward the sclera is trephined at a point corresponding to the highest detachment. The patient is kept in bed for two weeks with the eye bandaged. If the retina then appears reattached, two more weeks' rest in bed is required, but without a dressing over the eye. *M. H. Post.*

Mann, W. A., Jr. **Grouped pigmentation of the retina.** Arch. of Ophth., 1932, v. 8, July, pp. 66-71.

This condition received the above title from Niels Hoëg, who described it in 1911. It is characterized by pigmented spots in the retina from three to thirty in a clump, varying in size from a disc diameter to a diameter equal to the larger vessels of the retina; the larger spots lying nearer the disc. The entire fundus, or only a segment, may be involved. Some cases are unilateral, others bilateral. The vessels in practically all cases overlie the spots. Three photographs of the condition are presented with the paper.

M. H. Post.

Mayer, L. L. **An experimental study of detachment of the retina and its surgical therapy.** Trans. Amer. Acad. Ophth. and Otolaryng., 1931, 36th annual meeting, pp. 89-104. (See Amer. Jour. Ophth., 1932, v. 15, July, p. 664.)

Mayer, L. L. **The vitreous in experimental detachment of the retina.** Arch. of Ophth., 1932, v. 7, June, pp. 884-847.

Previous work demonstrated that despite an artifically made hole in the retina reattachment took place shortly. Other methods were, therefore, looked for. It was found that three minims of a one to four dilution of trypsin injected into the eye resulted in prolonged detachment of the retina, not however permanent. In eyes so treated the vitreous underwent an enormous increase in sugar, an increase in total nitrogen, an increase in surface tension approaching water, a decrease in aminonitrogen, and a decrease in hydrogen-ion concentration toward the acid side. *M. H. Post.*

Mylius, K. **Clinical and pathological studies of eye changes in eclampsia.** Zeit. f. Augenh., 1932, v. 77, April, p. 37.

Experiences recorded in an earlier paper lead Mylius to believe that functional vascular changes may persist for a long time without producing changes in the retina. With greater severity

edema may result from ischemia. Severe edema, hemorrhage, and white plaques result from overfilling of the venous system, so that even very small venules become visible. Increased blood pressure is not, the author thinks, responsible for retinal changes in eclampsia, and organic vascular changes play only a minor rôle. Mylius now reports his findings in anatomical studies of five pairs of eyes from women who had died in eclampsia. No significant organic changes in the walls of the branches of the central artery and vein could be found in any of the ten eyes. This substantiates his statement that spastic changes may persist for weeks without causing organic changes in the vessel walls. No signs of stasis or thrombosis were found after careful search, though such changes are characteristically found in the liver, kidneys, and brain. Neither were there any true fat emboli. The fat which was found was in fat cells which infiltrated the tissues. One cannot assert that glia and rods and cones are not involved in the fatty degeneration, but certainly most of the fat has its origin in the pigment epithelium. The choroidal vessels were completely free from thrombosis and stasis. The finely granular fatty infiltration of the vessel wall which in the brain, liver, and kidney is so characteristic for eclampsia was found in typical form in all the uveal vessels. *F. Herbert Haessler.*

Paul, L. **A ring for marking the axes of the retina on the anterior segment of the globe.** Klin. M. f. Augenh., 1932, v. 88, June, p. 798. (Ill.)

At the back of a graduated ring fastened on a handle is a second ring which may be rotated and fixated by a screw in any direction. It may be adapted to the cornea and limbus. The desired degree, which has been previously found by the localizing ophthalmoscope, is then marked by a screw, so that the axis on which a certain place in the retina lies is exactly determined on the cornea or sclera, as required, for detachment of the retina.

C. Zimmermann.

11. OPTIC NERVE AND TOXIC AMBLYOPIAS

Carle, Torsten. **Choked disc following attack of glaucoma.** Det. oft. Selskab i København's Forhandlinger, 1931, p. 31. In Hospitalstidende, 1932, May 19. (See Section 8, Glaucoma and ocular tension.)

Mathewson, G. H., and Alexander, B. **Blindness from methyl alcohol successfully treated by lumbar puncture.** The Canadian Med. Assoc. Jour., 1932, v. 26, June, p. 679.

This is the case report of a man treated by spinal-fluid drainage, whose vision improved from counting fingers soon after the debauch to 6/6 vision thirty-five days after the drinking of the methyl alcohol. This was in November, 1931, and the writers claim that this good vision has been maintained although some optic atrophy is present.

Keaser and Schrobak are quoted as saying that methyl alcohol injuries the brain and nerve tissue by being broken up into formaldehyde and formic acid. For treatment of methyl alcohol cases Mathewson and Alexander recommend repeated gastric lavage, large intake of fluid, pilocarpin sweats, and several removals of about 15 c.c. of spinal fluid. (References.) *Ralph W. Danielson.*

Stollova, Znojilova. **Retrobulbar optic neuritis following typhoid.** Oft. Sbornik, 1931, v. 6, pp. 255-257.

Two months after having typhoid fever, a man aged thirty-two years returned to the hospital with polyneuritis. He complained of blurred vision which steadily became worse. After eleven days, the retrobulbar neuritis passed into intraocular neuritis. Four months later the patient developed nephritis and became totally blind. He died of uremia. The author could not find a similar case in the literature.

G. D. Theobald.

NEWS ITEMS

News items in this issue were received from Drs. M. F. Weymann, Los Angeles, and Frank Albert Burton, San Diego. News items should reach **Dr. Melville Black, 424 Metropolitan building, Denver,** by the twelfth of the month.

Deaths

Dr. Arthur Kenworthy Hoge, Wheeling, W.Va.; aged forty-three years; died June 30.

Dr. Francis William Alter, Toledo, Ohio; aged sixty-five years; died July 19, of carcinoma of the colon.

Miscellaneous

The New York Hospital-Cornell Medical Center was opened September 1. This is the most concentrated medical plant on earth.

Eighty-two cases of trachoma had been discovered in New Jersey this year up to the middle of June. This is considerably above the average.

The second annual midwinter clinical course in otolaryngology and the first annual midwinter clinical course in ophthalmology will be given by the Research Study Club of Los Angeles, January 16-27, 1933. Details of the program will be published as soon as completed. For information address Dr. Don Dryer, secretary, 2007 Wilshire boulevard, Los Angeles.

Mrs. Matilda Ziegler, who founded a free magazine for the blind and financed its publication for twenty-five years died in September at her Fifth avenue home in New York city at the age of ninety-one years. A trust fund of $600,000 provided in her will makes possible continued publication of the Matilda Ziegler Magazine for the Blind, which is circulated without cost to some 15,000 blind readers in English-speaking countries. Mrs. Ziegler became interested in the blind because of an accident to a son by her first marriage which robbed him of his sight early in life.

The annual Fall course in ophthalmology conducted by Professor Terrien and his associates will be given in Paris at the Hôtel-Dieu beginning Friday, October 21 and lasting through twelve days. The fee is 300 francs.

Personals

Dr. Hans Barkan of San Francisco has been elected president of the Pacific Coast Oto-Ophthalmological Society.

Dr. Frank Albert Burton has announced the removal of his offices to suite 1206, Bank of America Building, San Diego.

Dr. Agnes Beulah Cushman has been appointed clinical instructor in the department of ophthalmology, Rush Medical College.

Dr. Joseph Mülzer of the University of Heidelberg was designated to receive the Carl Barck fellowship in ophthalmology established a year ago.

At the recent meeting of the Michigan State Medical Society at Kalamazoo, Drs. George F. Suker, Chicago, and Walter I. Lillie, Rochester, Minnesota, presented papers.

The University of Vienna has bestowed on Dr. George W. Mackenzie a gold honor medal with a diploma of the university in recognition of his work in diseases of the eye, ear, nose and throat.

Dr. Joseph Hamburg, chief ophthalmologist to the Jewish Hospital, Cluj, Rumania, has been carrying on extensive experiments with the treatment of optic nerve atrophy by increasing cell oxidation.

Dr. William Franklin Hughes, Indianapolis, has been appointed head of the department of ophthalmology at Indiana University School of Medicine to succeed the late Dr. Albert E. Bulson. He has been a member of the school faculty since 1903.

Dr. John O. McReynolds, Dallas, Texas, has presented to the University of Texas School of Medicine a scientific exhibit of the crystalline lens system in man and the lower animals. The collection consists of photographs and mounted lenses of the various species of the animal kingdom, and three hundred cataract lenses removed in the capsule, together with slides illustrating the pathologic processes and the embryology of lenses.

Dr. John F. Gipner will open offices on September 1 at 405 Medical Arts building, Rochester, New York.